TECHNOLOGY DEPT.

Gas Journal

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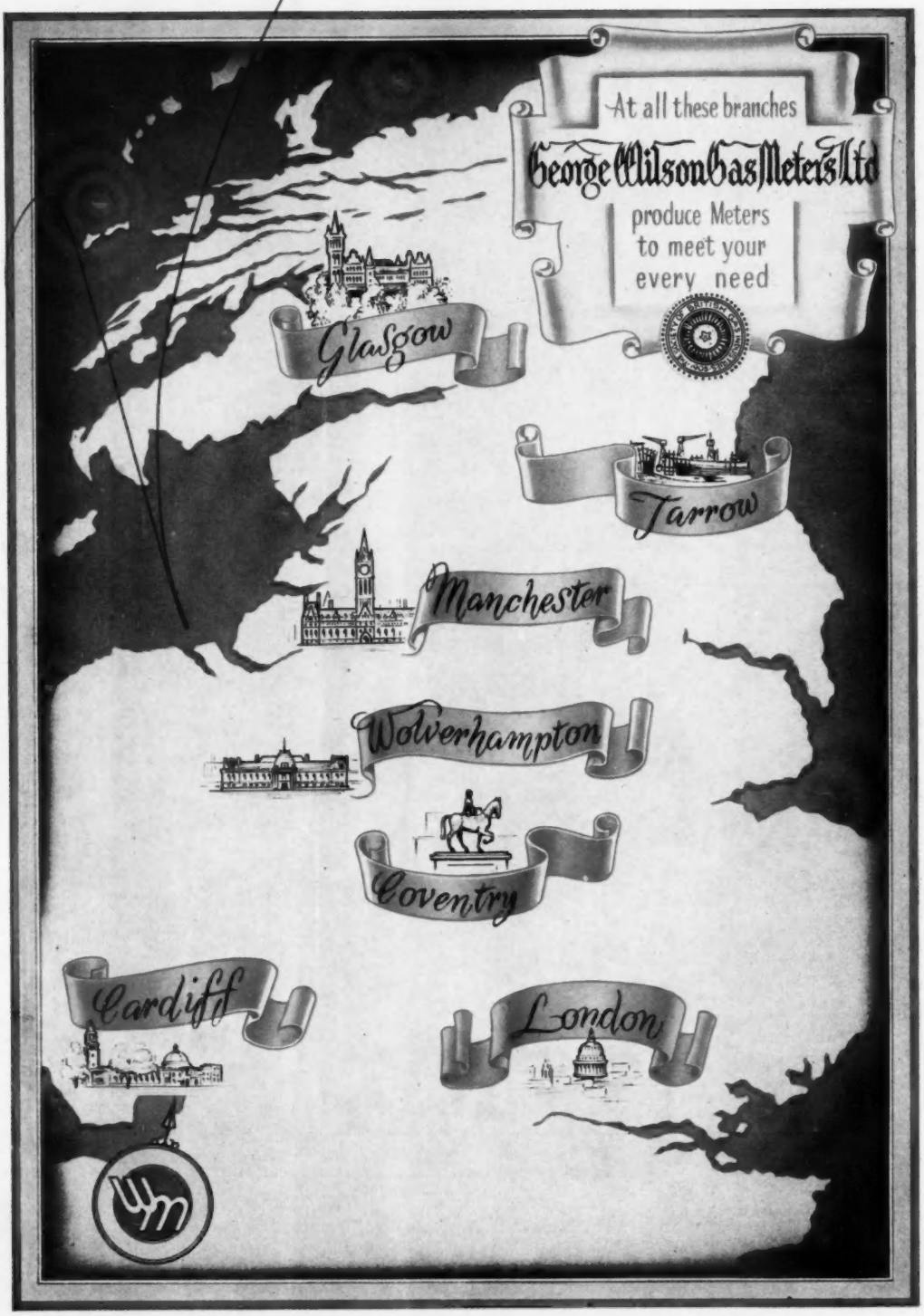

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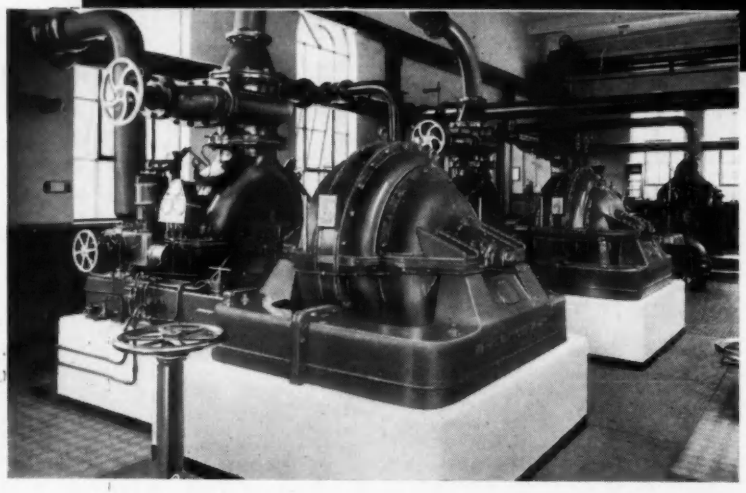

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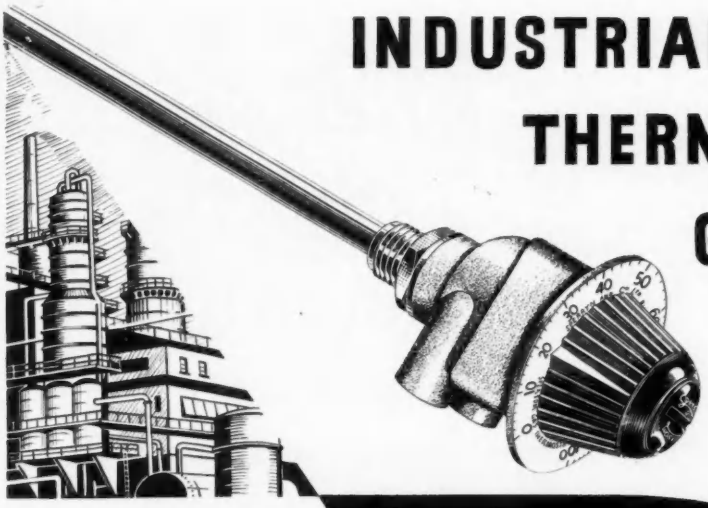

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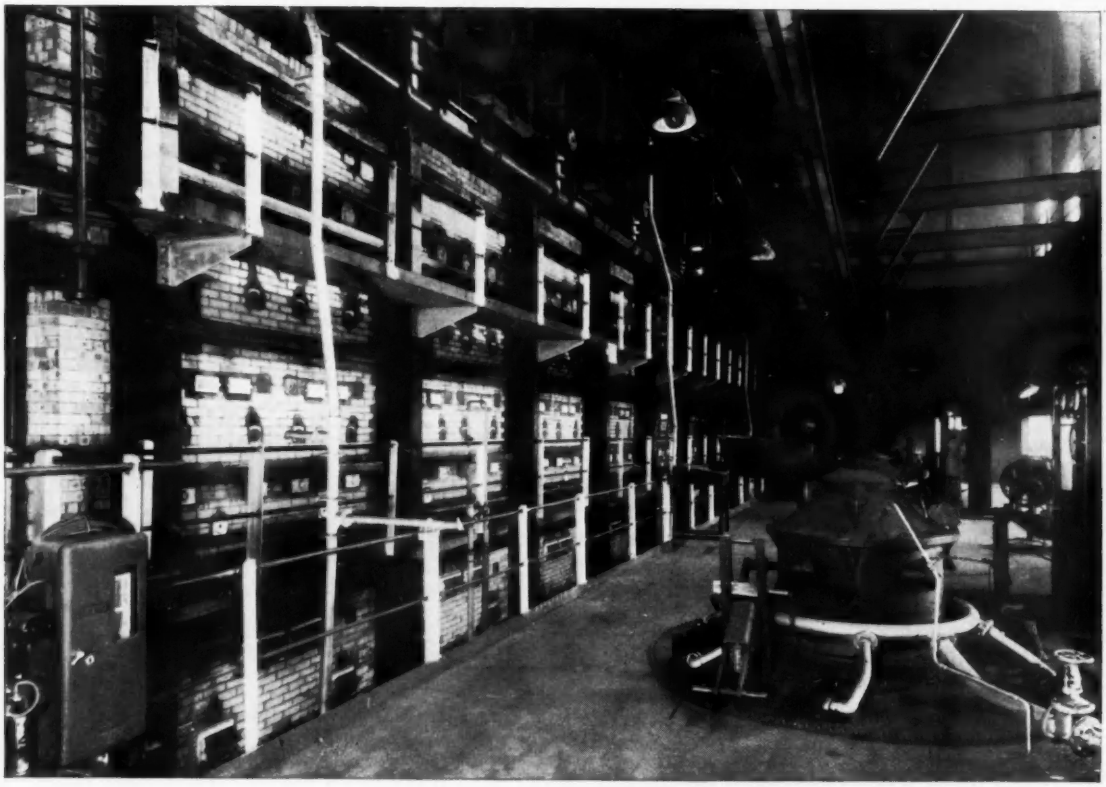

Unretouched photograph published by courtesy of the North Western Gas Board

View showing top of Mechanical Producer Charging Platform and setting controls with platforming at Bradford Road Works, Manchester. Mechanical Producers by H & G

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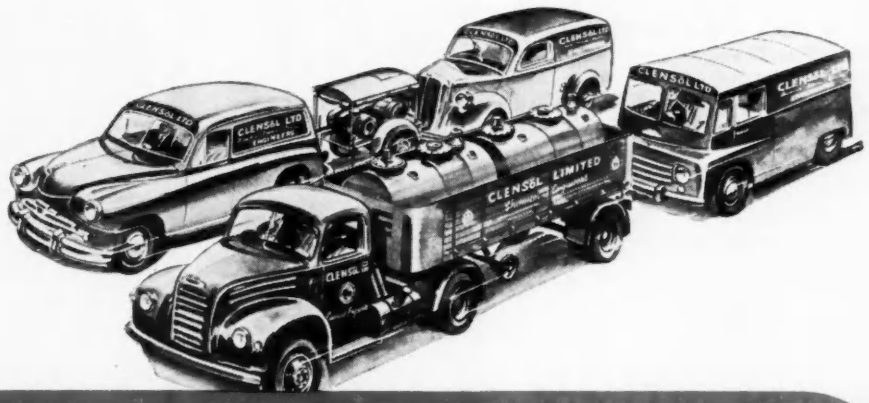

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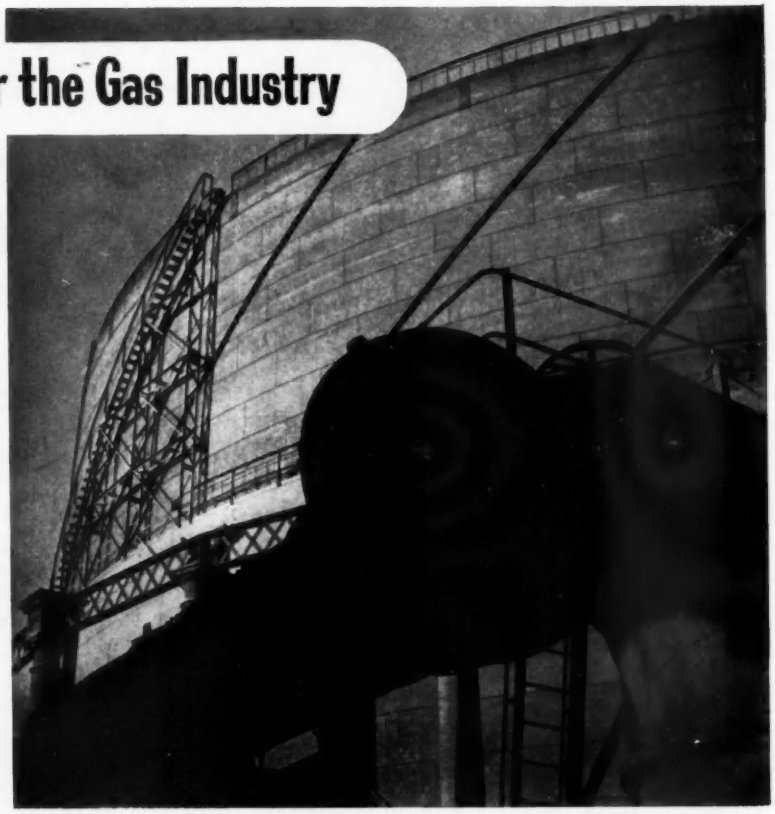

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W.W-D.

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For the New Gas Making Processes

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SITE	NO. OF UNITS	TYPE OF GAS	CAPACITY M.C.F.D.
*1 Kensal Green N.T.G.B.	1	Hot G.I. (Comp. Gasification) ...	12
*1 Kensal Green N.T.G.B.	1	Cold G.I. „ ...	6
2 Sydney, Australia	2	High B.T.U. Oil Gas	13
* Stratford N.T.G.B.	1	C.W.G. (Heavy oil)	15½
2 Watford E.G.B.	1	Complete Gasification	4½
* Surabaya (Indonesia)	1	ONIA-GEGI	4
*3 Warrington N.W.G.B.	1	C.W.G. (Heavy oil)	11
Ponders End E.G.B.	1	Segas	8
*3 Portsmouth S.G.B.	1	ONIA-GEGI	11½
2 Uxbridge N.T.G.B.	1	Segas	4
*4 Gloucester S.W.G.B.	2	Hot G.I. (Comp. Gasification) ...	15½
*4 Gloucester S.W.G.B.	1	Cold G.I. „ ...	10

NOTES

*Detarrers handling cyclic gas before the relief holders.
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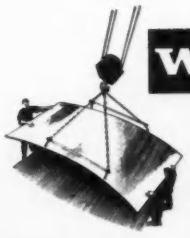

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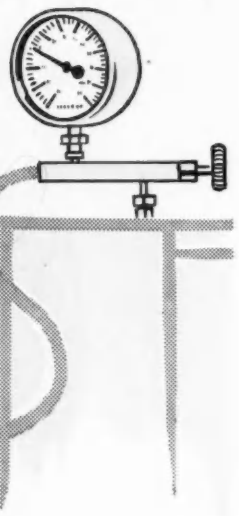
ARE SERVING THE GAS INDUSTRY



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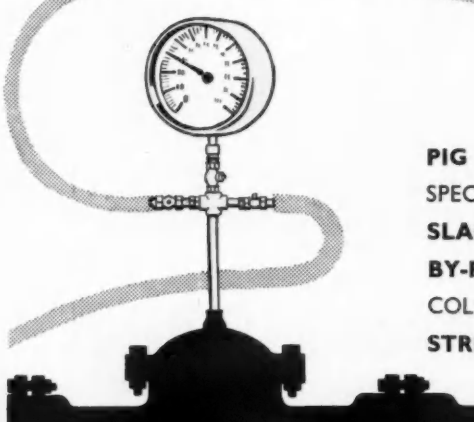
7 in. to 10 in. ..	75 lb. per sq. inch	60 lb. per sq. inch
12 in. to 24 in. ..	60 lb. per sq. inch	50 lb. per sq. inch
27 in.	40 lb. per sq. inch	30 lb. per sq. inch



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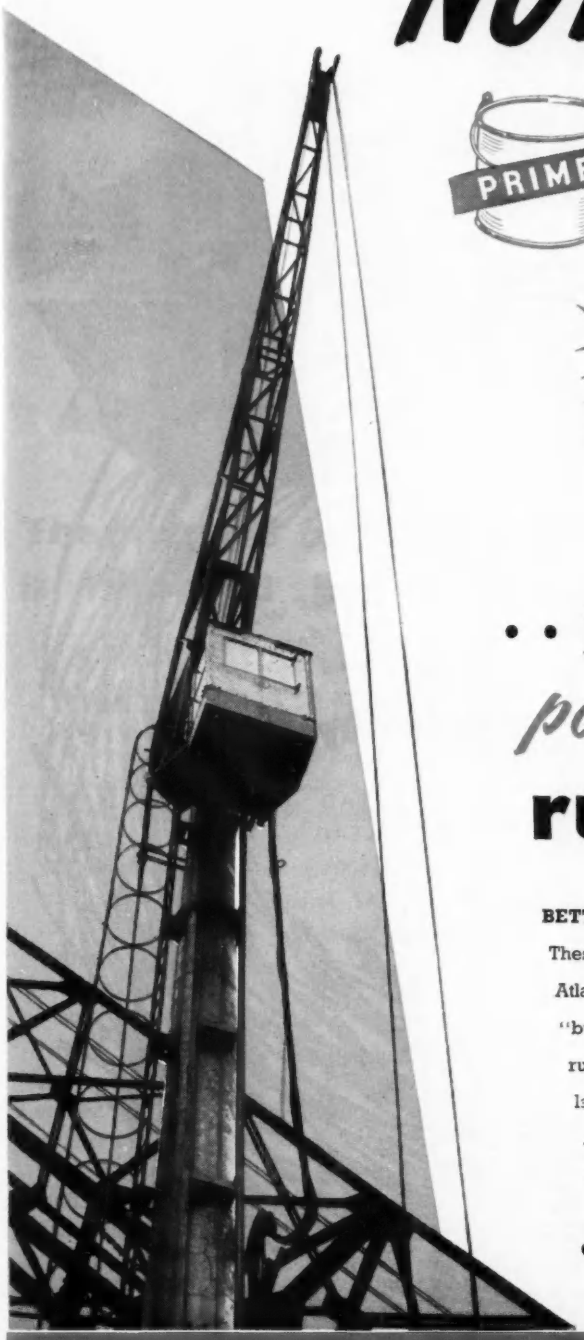

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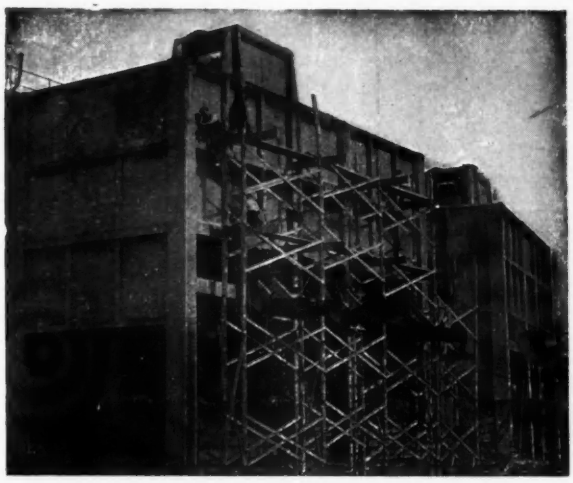

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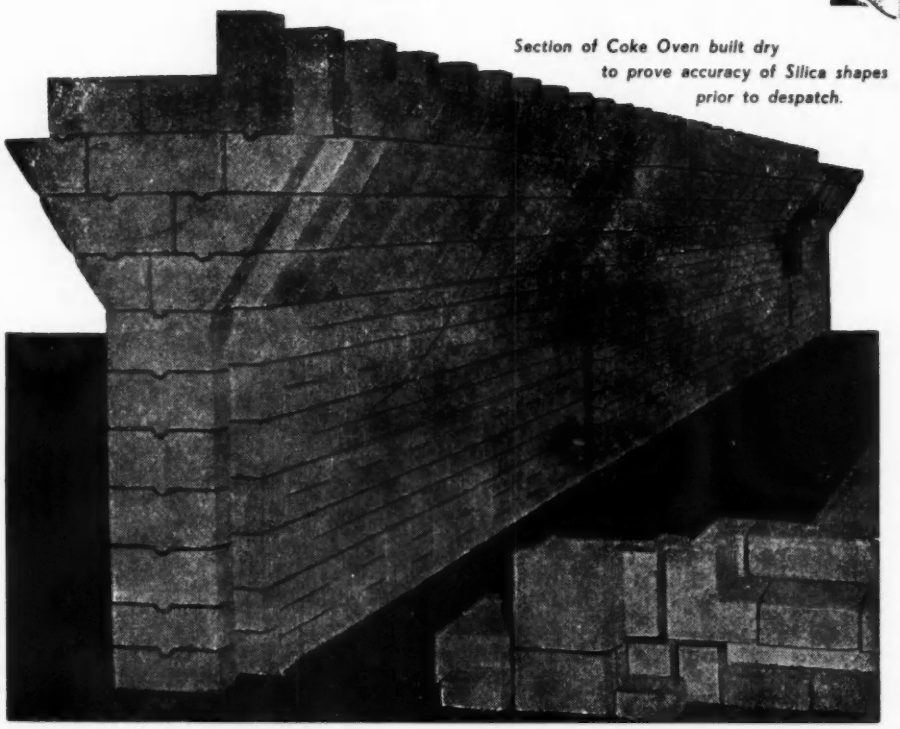

Section of Coke Oven built dry to prove accuracy of Silica shapes prior to despatch.

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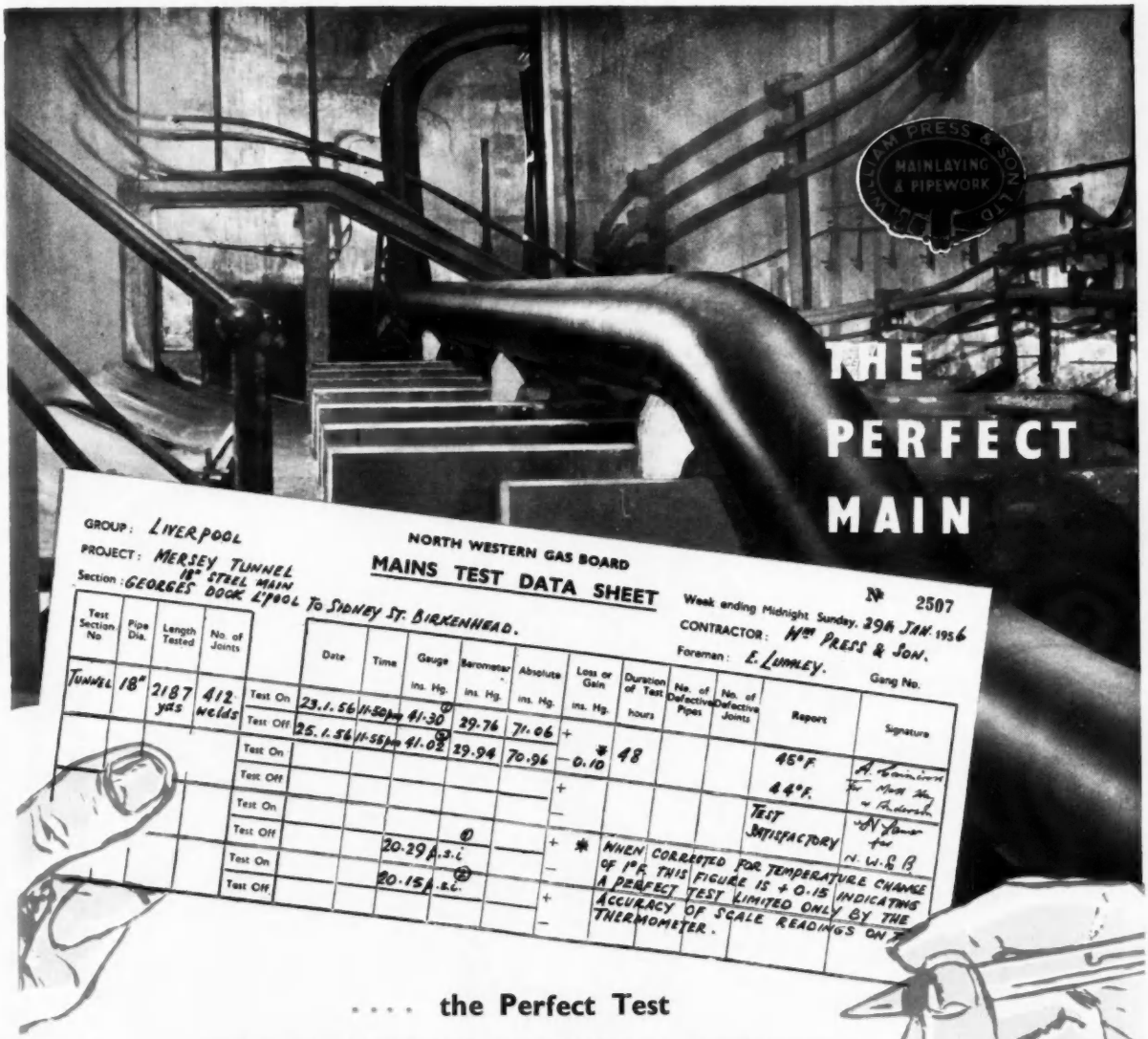

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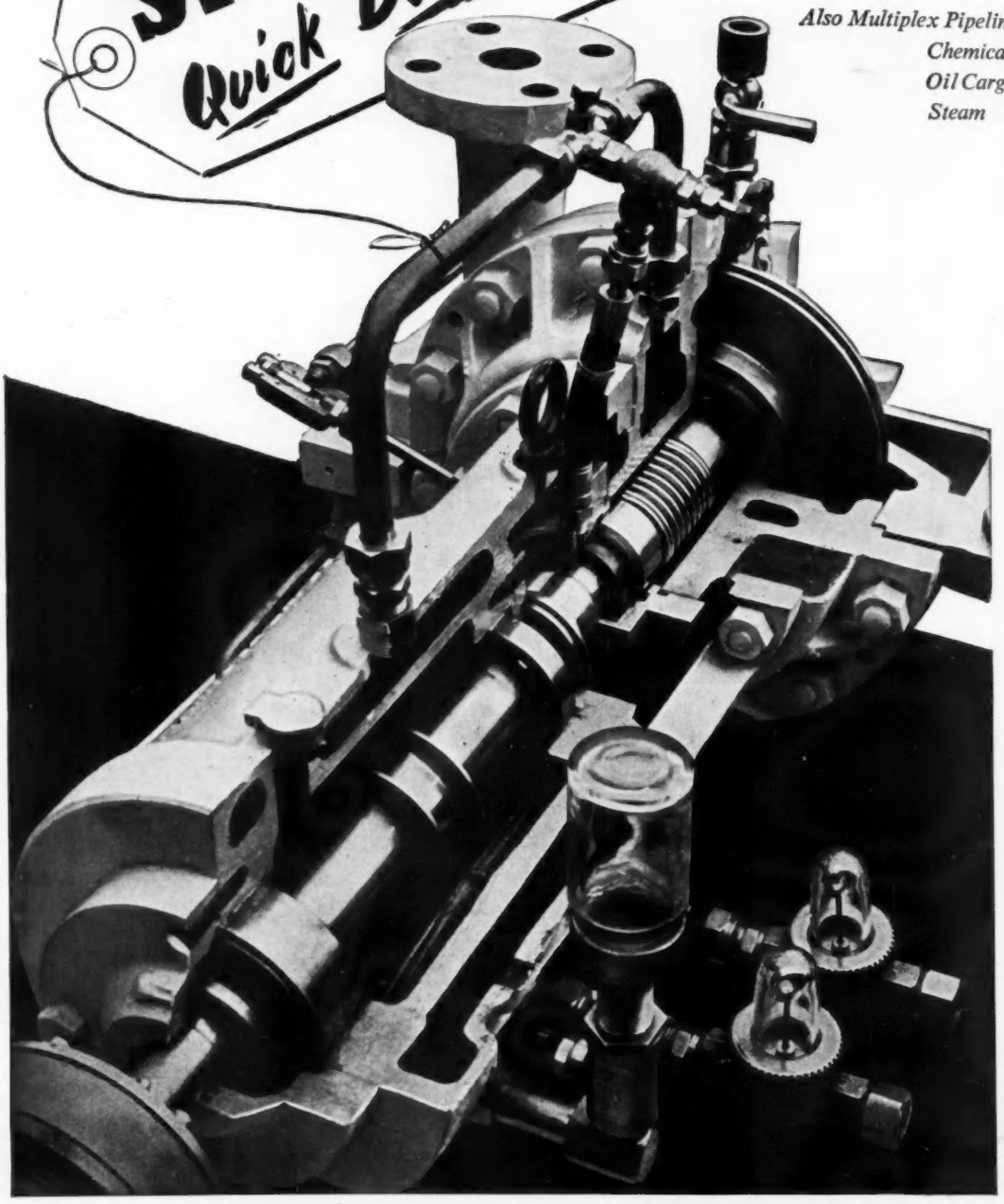

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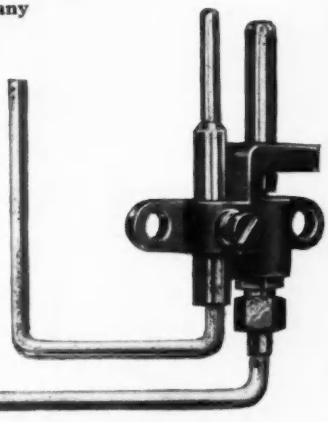

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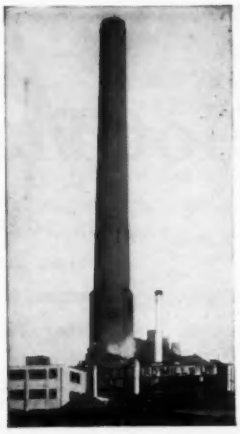

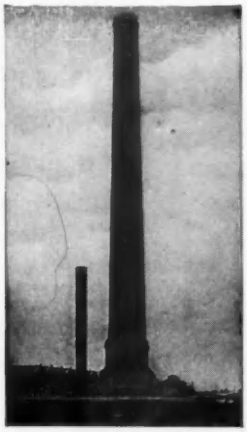

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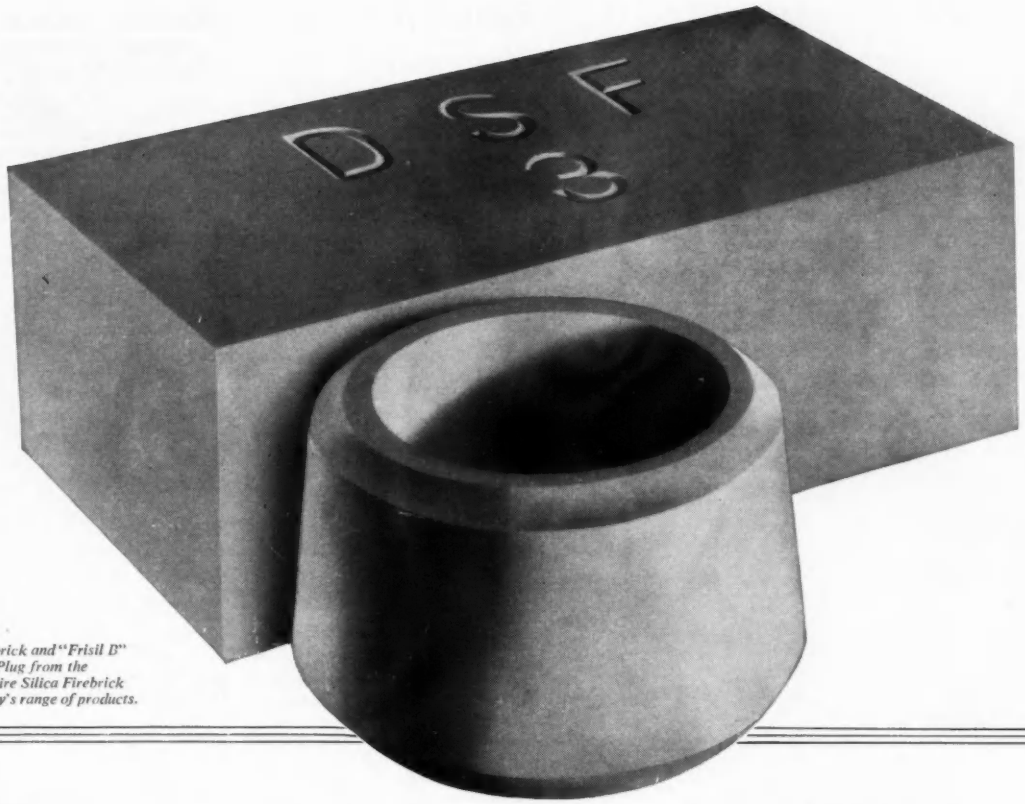

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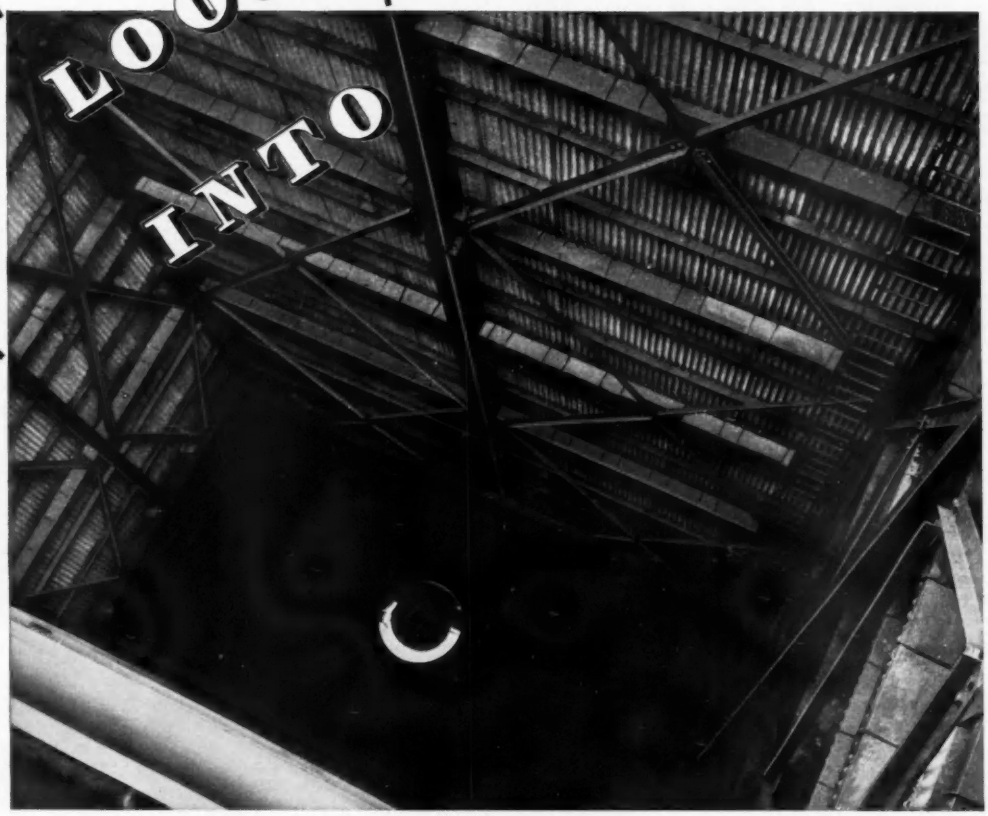

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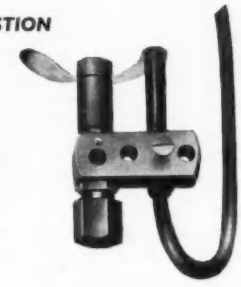

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Gas Journal

VOL. 287 *NO. 4852* *July 11, 1956*

108TH YEAR

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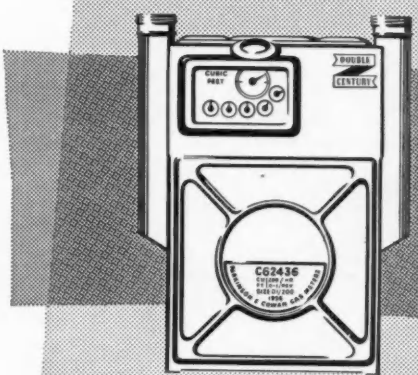

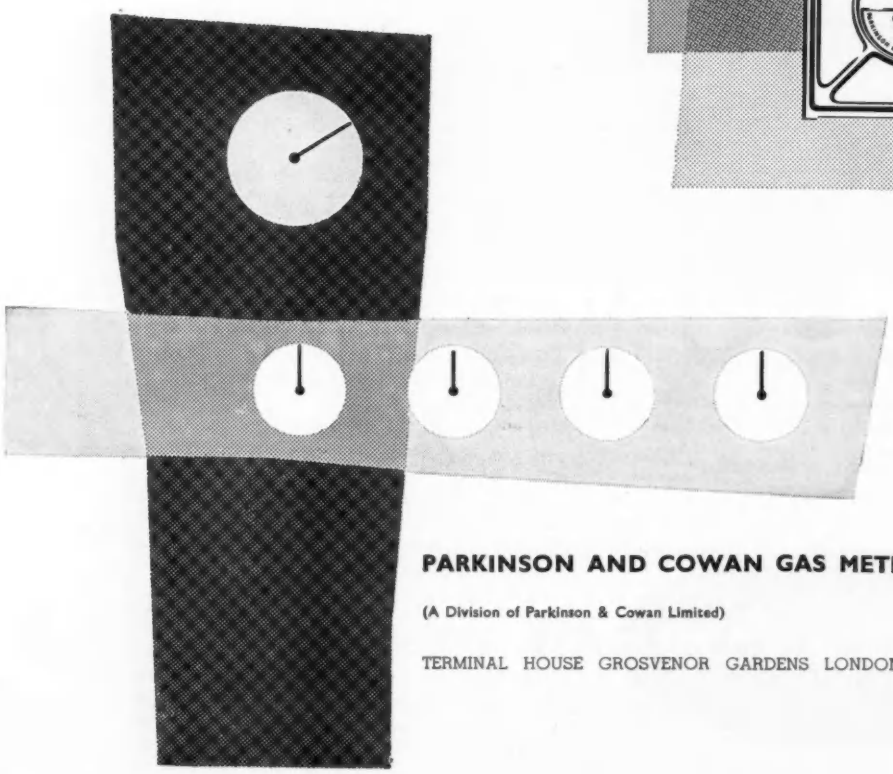

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Gas Journal

VOLUME 287. No. 4852. JULY 11, 1956. 108th YEAR

Energy and the Future

THE United Kingdom and Western Europe are short of energy and have been so ever since the end of the war, and if our economy is to continue to expand in the way in which we would like it to, this shortage must be overcome. In Great Britain our only indigenous form of energy is coal, and that always seems to be in short supply—in fact a great deal has had to be imported in the last few years at a high price, which has disturbed all efforts to stabilize the cost of living. To overcome this shortage and the apparently hopeless task of expanding coal production, there are several courses open. They may be divided into three main headings: The more efficient use of what fuels we have; the utilization of waste products, that is, fuel that would be useable if it could be made so; and the use of completely different types of fuels.

The campaigns in recent years for the burning of fuels more efficiently, both solid and gaseous, are well known to all of us, and best of all to the poor, confused housewife, who is being continually wooed by all the fuel industries at once, so much so that she really does not know where she is. She is exhorted to cook by gas, electricity or some form of smokeless fuel by the interested parties concerned, each putting an excellent case forward; she is persuaded to put in smokeless fuel grates, and all that happens is that the necessary fuel becomes so expensive, or the quality deteriorates (in the case of solid fuel), so she falls back on the old, familiar coal which, generally speaking, gives the kind of fire for cooking or space heating to which she is accustomed.

Of course, this is only one aspect of the question. Another, a very much larger one, is the industrial aspect. Here the industrialist can have the full resources of expert fuel technologists to advise and guide him in what new plant he installs, or what alterations can be made to existing plant to consume the fuel more efficiently. If the industrialist can be persuaded that by taking the proffered advice he will be saving money by saving fuel, he will adopt the ideas put forward, even though the capital cost may be high, and by saving fuel make a contribution to the country's energy problem. If by the installation of more modern equipment, not only would the efficiency be increased (for example, an improvement in transfer of heat to the water in steam raising) but also the actual combustion of the fuel it would go a long way towards solving our very severe smoke problem, and by so doing largely diminish the gap between coal consumed and coal produced. An excellent example is shown by the modern integration of steel manufacture, where heat is being conserved at every point, with the result that there is a large surplus of coke oven gas available to the area board grids. The tendency in the large modern gasworks now being built is to raise all steam by waste heat from the retort settings and to generate all the necessary electrical energy for works use from this steam, and have spare power to export to the electricity board.

The second way open to improve our energy position is perhaps less well known and is only now getting much publicity. This is because steps to solve the problems involved are only now being realized. The spread of mechanical mining since the war, and much more so since nationalisation, is causing a great increase in the production of dirt and dust. So great has this problem become that the stocks of coal dust stand at several million tons and are increasing by as much as one to two million tons every year. The National Coal Board, at its research station at Stoke Orchard, near Cheltenham, is spending a great deal of time and thought on the utilization of this dust.

Cleaning the dust is a very difficult matter but, as we saw during a recent visit, it is being successfully carried out by oiling the coal before washing and then blowing in air. This brings the coal to the surface where it can be taken off, while the dirt remains at the bottom of the washer vessel, as it is more completely wetted by the water. This dust can be used as pulverised fuel for steam raising or further processed to produce domestic fuel. When the coal is already smokeless, the dust may be mixed with a binder, such as a suitable grade of pitch, straight away, made into a small briquette or ovoid under pressure, and carbonized. This is the well-known Phur-

nacite process, which is producing a very successful domestic fuel for cookers and hot water boilers. The raw material used for Phurnacite is a dry steam coal of about 12% volatile content. The other coal dusts available are of many differing qualities and characteristics, and it is the aim of the National Coal Board to process these dusts too. They may be smokey, caking, or non-caking, and each may have to be pre-treated in a different way to up-grade it, involving pre-oxidation or semi-coking to give a char. The pre-treated dust is mixed with a suitable binder, briquetted, and carbonized at a low temperature to give a fuel that will take the place of house coal. This will burn in the open fire but will be completely smokeless. Much work is being done by the National Coal Board in the perfection of a new process of carbonization by red hot sand to reduce the time necessary for the carbonization of the briquette, and pilot plants indicate that this may be reduced from four hours for the Phurnacite process to 35 minutes. This will reduce the capital cost of plant for a high throughput, and should make the price of the fuel competitive with raw coal. As these briquettes are controlled in every stage of their manufacture a standard product is possible, and very little breakage should occur. The housewife can then be supplied with an almost perfect fuel, and provided it is available at an acceptable price, it would not enter her head to consider buying coal. In fact, in ten years time the 'black' areas might be smokeless. As for coke, is the market not large enough for both fuels?

The last heading under which the energy problem may be solved is by the use of other fuels. This includes oil and, of course, atomic energy. Oil is being developed very rapidly both as a refined fuel and as a source of chemical raw materials, but it may be some years before atomic energy will be able to take its full share. Perhaps by 1975 it will be taking over the production of low grade energy and will then release coal for more important purposes. Coal, as well as being a fuel and source of energy, is also a chemical raw material. Fifty or sixty years ago oil was only a raw material in the production of kerosene for oil lamps. Coal is still at that stage. But is it not time that coal, too, be allowed to come into its own and no longer be the most 'fossilized' of fossil fuels? Then there will be no competition between fuels. We shall need them all, and all in their proper places; each contributing to our energy requirements in the best and most efficient way.

A Question of Policy

RECENT conversations with some of those most closely associated with the use of gas liquor as a nitrogenous dressing in the Southern area—including farmers, spraying contractors and Gas Board representatives—have revealed the beginnings of a problem which has got to be tackled promptly and effectively at top level. This question of policy has been brought to the fore to some extent as a result of the Southern Board's gas liquor display at the Royal Counties Show at Poole—the first such exhibit at any agricultural show. First of all, much credit is due to this Board for once again making history in the gas liquor field. It was a bold step, but one amply justified by results; and it is to be hoped that the idea will quickly spread to all areas.

As was to be expected at a big show of this kind, enquiries were received on the liquor stand from farmers and contractors outside the jurisdiction of the Southern Board—and all the representatives in attendance could do was to refer enquirers to their local gas board offices. And now the question arises, what will happen to those enquiries next?

It is common knowledge that some gas boards have spent a fair amount of money on sulphate plants, and it will be recognised that substantial quantities of ammoniacal liquor must be drawn in from gasworks throughout the area in order to keep such plants going at a steady rate of production and on a scale adequate to meet the capital charges and show a reasonable margin of profit. On the other hand, with an ever-growing demand for gas liquor on the land, gas boards should not be committed to this policy to the exclusion of liquor spraying. They cannot just ignore something that is already an established part of the industry's service to the community. There must be a spirit of compromise in this matter since the industry obviously cannot deny to farmers in one area what is readily available in another. Autonomy may be a very good thing in theory, but when it results in divergence of policy within a nationalised industry then the whole is brought into disrepute, if not ridicule. Unfortunately, instances have already occurred of difficulty in getting supplies of liquor to meet demands in certain areas, and it may be pertinent to ask if there is sufficient co-ordination of both information and policy at top level. It is also a little surprising that the Gasworks Effluents Committee, which must surely be closely interested in this subject, should have maintained such a profound silence since their last comment (was it not in 1939?) on this obvious and valuable means of disposal.

It was left to a small band of enthusiasts—one might almost say to one far-sighted individual—to pioneer this new service on a commercial scale; and it has now been a going concern for upwards of six years, and its popularity is spreading almost daily. One must not belittle caution, but one now has the curious situation of farmers demanding a service which some gas boards are not, apparently, yet ready or able to give. This notwithstanding the fact that it is a service which, through the co-operation of spraying contractors, costs little or nothing to give and may, indeed, be a godsend to many works.

The tide of gas liquor is now flowing strongly, and no section of the gas industry will be wise to try to play the part of King Canute.

Oil For Eire

THE gas industry's increasing interest in oil refineries gives some significance to the announcement by the Eire Minister for Industry and Commerce of his acceptance of a joint proposal by the California Texas Corporation, Esso Petroleum Company, and Shell-Mex and B.P., to erect and operate a £12 mill. oil refinery at Whitegate (Co. Cork).

It appears that the refinery will supply from the outset Eire's entire needs for the major petroleum products, motor spirit, automotive and industrial diesel oils, gas oils and fuel oils representing approximately 80% of the market in all petroleum products. It will also have flexibility to make other petroleum products, such as aviation turbo fuel, tractor vaporising oil, burning oil (paraffin) and liquid petroleum gas.

The refinery will have a capacity of 1.6 mill. tons of crude oil per annum, or 1.5 mill. tons of finished products. When in full operation the refinery will give permanent employment to about 400 men. Construction is expected to take about three years. A large site has already been acquired.

Personal Notes

MR. S. E. WHITEHEAD, O.B.E., is retiring from the position of Deputy Chairman of the Southern Gas Board which he has held since January, 1949. He has been in the gas industry for 47 years. Mr. Whitehead was trained in the Birmingham Gas Department and, after periods with the Southport Gas Undertaking and the Department of Explosives Supply, was appointed assistant to Mr. Carmichael, Chief Engineer of the Portsmouth and Gosport Gas Company. He was appointed Chief Engineer of the Southampton Gaslight and Coke Company in 1930, General Manager in 1932, and Managing Director in 1944, being in the meantime elected as a Director of the Portsmouth and Gosport Gas Company. In addition to being a member of the Institution of Civil Engineers and the Institution of Mechanical Engineers, he was President of the Southern Association of Gas Engineers and Managers in 1937, and President of the Institution of Gas Engineers from 1944-45.

MR. H. W. H. ICOUGH has retired from G. A. Harvey & Co. (London) Ltd., after 50 years of service.

MR. H. E. COLLINS, C.B.E., has been appointed Director-General of the newly created Reconstruction Department of the National Coal Board. The new Department will come within the field of responsibility of DR. W. REID, the Board Member for Production, and the responsibility for carbonization, which he has also held, will pass to MR. A. H. A. WYNN, the Scientific Member. MR. J. H. PLUMPTRE, now a Deputy-Director-General of Production at headquarters, has been appointed General Manager of the South-Eastern Division. MR. J. NORVAL, now Chairman of the Divisional Board, has been appointed Chairman of the Executive being set up to develop and exploit underground gasification, responsibility for which has recently been passed from the Ministry of Fuel and Power to the N.C.B. MR. H. H. PARTRIDGE is relinquishing his post as Divisional Marketing Director.

MR. A. E. MORTON has been appointed Sales Manager (compressor division) and Publicity Manager by Mackay Industrial Equipment, Ltd., of Faggs Road, Feltham, Middlesex. He succeeds MR. D. H. ROBSON who has joined the Free-Piston Engine Company as General Sales Manager and Local Director.

MR. E. J. CLARKE, Chief Engineer of Murex Welding Processes Ltd., Waltham Cross, Herts, has retired after 38 years' service with the Company. To mark the occasion he was presented with a fitted wardrobe.

MR. J. C. NEVILLE has been appointed Chairman, and Mr. A. T. Scales, Managing Director of J. C. Neville, Ltd., 34, Priest's Bridge, London, S.W.14.

Diary

July 9-14.—SOCIETY OF CHEMICAL INDUSTRY: 75th Annual Meeting London.

July 16.—EASTERN G.C.C.: Connaught Rooms, Great Queen Street, Kingsway, W.C.2, 2 p.m.

July 23.—WEST MIDLANDS G.C.C.—Birmingham Education Department, Council House, Margaret Street, Birmingham. 3 p.m.

INDUSTRIAL GAS ADS

Ceramics
Josiah Wedgwood 'threw' this, the famous Portland Vase, towards the end of the 18th century—but now the 'thrower' is legendary. Once, kilns fired by raw coal spread filth and disease over a blackened countryside—but modern smokeless fuels like gas have altered the picture. The constant calorific value of town gas means automatically controlled faster firing schedules and increased productivity.
WHATEVER YOUR BUSINESS—The Gas Industry appreciates the needs of individual consumers for prompt service and for advice which accords with the customer's special circumstances and requirements. Each Area Gas Board offers efficient service to users of gas-fired equipment and can give expert advice based upon the pooled knowledge of all the Boards and of gas users in other countries.
—CONSULT YOUR AREA GAS BOARD
ISSUED BY THE GAS COUNCIL
THE GAS INDUSTRY MAKES THE BEST USE OF THE NATION'S COAL

Above is a sample of the Gas Council's latest—and probably best—series of industrial advertisements. Layouts are striking, copy is slick and to the point, and the versatility of gas for countless industrial heating processes is well brought out. Perhaps the Council will now turn its attention to re-shaping its domestic advertisements. Some of its babies must be almost grown up by now!

EXPANSION OF TECHNICAL COLLEGES

CONDITIONS for the designation of colleges of advanced technology have been announced by Sir David Eccles, Minister of Education, in a circular to local education authorities.

The Minister has also outlined the present organization of technical colleges and suggests how each kind of college can best contribute to the Government's five-year plan for technical education. The Government's object is to provide a framework for expansion, based on the existing structure, which will be flexible and will take account both of the limiting factors, such as the supply of teachers with the highest qualifications, and of the need to provide courses within reasonable reach of students.

Co-ordination Needed

Regional co-ordination is essential to the success of this policy, and the Minister looks to the local education authorities to co-operate fully with one another, and to the regional advisory councils to assist them in achieving a rapid and efficient expansion. Within the regional pattern, colleges will be encouraged to expand the volume of their work.

The Minister considers it important that a small number of technical colleges should develop as speedily as possible into colleges of advanced technology, concentrating entirely on advanced studies and providing a broad range of work of the highest quality. The colleges will be formally designated as soon as the Minister has been able to satisfy himself that the college already fulfils or will shortly be able to fulfil certain conditions.

The governing body of a college of advanced technology must include strong direct representation of industry, besides representatives of local education authorities, universities and professional technological interests; it must have freedom to spend within the heads of approved annual estimates. Teaching conditions must approximate to those for work of equivalent standard at the universities, and the staff must have opportunities for research.

Local Colleges

Local colleges provide courses, mainly part-time, up to the level of Ordinary National Certificate or its equivalent. Many new local colleges will be needed as part of the programme of doubling the number of part-time day release students and of increasing greatly the supply of technicians and craftsmen.

Area colleges provide in addition varying amounts of advanced work, again mainly part-time. A wide distribution of part-time advanced courses is necessary for the many students who are unable to undertake full-time or sandwich courses, but there is a limit to the number of such colleges if teachers and equipment are to be used to the best advantage.

Regional colleges do a substantial amount of advanced work, including in particular full-time and sandwich courses, but the volume and character of the advanced courses is not such as to make it realistic for the college to concentrate entirely on such work.

'New Tariff Will Encourage Consumption'

N.E.G.B. RATES IN STEP WITH GAS COUNCIL, SAYS CHAIRMAN

DESIGNED to encourage people to use more gas, changes in the Board's tariff structure were announced at a meeting in Leeds of the North-Eastern Gas Consultative Council, last week, by Dr. R. S. Edwards, Chairman of the North-Eastern Gas Board.

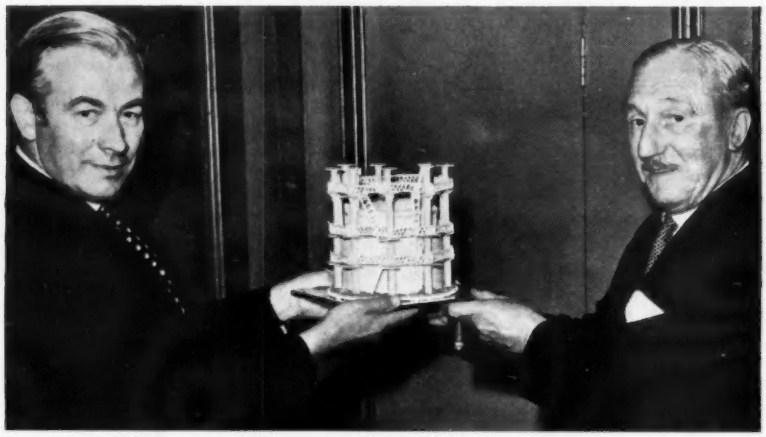
The new tariff, to be introduced from August 1, will be a one-price structure for all 850,000 consumers in place of the present three-zone arrangements. The proposals were unanimously approved by the Consultative Council.

100,000 Will Benefit

Outlining the new tariff, Dr. Edwards said it would mean a reduction for some 100,000 consumers, no material change for 200,000, and an increase for 550,000. But consumers would pay less if they used more.

The maximum increase would be to those using not more than 20 therms per quarter, who would pay another 5½d. per week, while the greatest benefit would be derived by the East Coast consumers in zone three, who lived furthest from the coalfields.

Dr. Edwards explained that the existing tariff operated in nine blocks in three zones, with prices ranging from 22.75d. per therm for the first 25 therms per quarter to 15.5d. per therm for gas consumed in excess of 7,500 therms. From August 1 there would be only four blocks, ranging from 26.5d. for the first 20 therms to 14d. for therms over 7,500.



To celebrate Sir Harold Smith's 50 years' service in the gas industry, and his award of the Birmingham Medal, Mr. Ernest Atkinson, London Editor of the Birmingham Post and Mail, *recently gave a small luncheon party in his honour at the Reform Club. Here Mr. Atkinson presents Sir Harold with a cake modelled as a gasholder.*

He stressed that the Board was doing nothing which in any way conflicted with the Gas Council's decision to peg prices until the year end. They were at one with the statement issued by the Gas Council and also they fully expected to be able to maintain the new tariff until the end of the present financial year, and, indeed, substantially beyond then unless something unexpected happened.

Incentives

The feeling of the Board was that it could now proceed with an incentive tariff which would encourage people to use gas. This had not been possible before because of the need for appreciable amounts of extra revenue, and because it had not been possible to meet all reasonable demands for gas.

Welcoming the new tariff, County Ald. H. Sutcliffe, Chairman of the Council, said it was the only means of cheaper gas ultimately to all consumers.

County Ald. Mrs. Jessie Smith, of Colne Valley, while expressing her approval of the new tariff, felt some concern about the possible effects on the poorer sections of the community who used only small amounts of gas.

Many in Category

In reply, Dr. Edwards said that unfortunately there were many consumers who used substantially less than 20 therms per quarter, but they were by no means all in the category described by Mrs. Smith. The Board, he said, would be prepared to give sympathetic consideration to cases of genuine hardship.

N.T.G.C.C. MEETING SAYS NO TO SPECIAL ALLOWANCES FOR PENSIONERS

A RESOLUTION asking the Minister of Fuel and Power for special allowances in the price of gas for old age pensioners and persons on fixed incomes was defeated unanimously at a meeting of the North Thames Gas Consultative Council recently. Even the seconder abstained from voting.

Main argument against the proposal was that old age pensioners ought to be given enough money to buy the necessities of life without having 'meal tickets' for concessions.

Said Councillor H. J. E. Palethorpe: 'Fundamentally, I agree to assisting old age pensioners, but I believe the principle we should subscribe to is that old folk should have the money in their pocket to buy everyday things of life. We ought to be saying, here is a social problem, not a gas consultative one.'

Another member said he only wanted to see such a concession given to people in real need. There were many old age pensioners who were comfortably off, while there were others who were not.

Alderman D. Wray, who put the proposal, said subsidies were part and parcel of the existing system. 'I am against subsidies in any shape or form, but we must meet the circumstances of the day.'

Mr. H. L. De Bourcier, M.B.E., Secretary of the Coal Consumers' Council, addressed the members on how complaints were dealt with by his Council.

A heated question-time followed, with members expressing dissatisfaction at the lack of facilities for complaints to be made by the public.

Councillor Palethorpe was so disturbed at the lack of local contact that he suggested: 'Why not let gas consultative councils look after the interests of consumers of coke from gas boards?'

Integration Closes Sidmouth Gasworks

RECENT addition to the growing list of gasworks to succumb to integration is the Sidmouth (Devon) works which has just ceased production. The town is to have a bulk gas supply.

The first Sidmouth gasworks was built in 1835 at the base of the Peaslands. Coal was received by sea. In 1863, a second works was built at the eastern end of the Esplanade, now a car park.

The decision to close the existing works is in accord with the Gas Board's integration scheme.

STILL THE PRICE OF GAS GOES UP

Scotland Raises Charges by 1d. a Therm

AN increase of 1d. a therm in the price of gas has been announced by Mr. Sydney Smith, Chairman of the Scottish Gas Board, due to the latest rise in coal prices, which average 6s. 8d. a ton, and will amount to an additional £830,000 on the Board's annual coal bill.

Higher coal prices also affected the price of coke oven gas purchased by the Board, and this would result in a further increased cost of about £400,000 a year, said the Chairman, bringing the overall increase to £900,000.

Down on Balance

Against this could be set additional revenue from an increase of 9s. a ton in coke prices and 4s. 6d. a ton in the price of coke breeze, but the net effect would be higher costs of about £400,000 during the current financial year and of about £500,000 in a full year.

Apart from this the recent spate of increases in wages and salaries, coupled with the higher coal charges, would push up the cost of repairs and maintenance, and because of the steep drop in sales of appliances due to hire purchase restrictions, income from this source would be reduced.

Substantial Deficiency

The Gas Act, 1948, required each area board to ensure that their revenues were not less than sufficient to meet their outgoings. This the Scottish Gas Board had endeavoured to do since vesting date; so there were no profits to reduce. Indeed, although the Board's accounts for the financial year ended March 31, 1956, were still subject to audit, they would show a substantial deficiency.

Unfavourably Placed

The Scottish Gas Board was unfavourably placed for the accumulation of reserves, continued Mr. Smith. It was assessed for rates on the 'revenue principle' which meant that rates were paid on profits.

Half of any profits made, therefore, would have to be paid away in rates, and 25% a year of the present annual turn-over of £25 mill. would cost the Board's customers an extra £1 mill. a year.

No Reserves

For that reason and in the interests of consumers the Board had no reserves on which to draw, and it was hoped that the Valuation and Rating Bill would do something towards removing this injustice from Scottish gas consumers.

The Board had achieved considerable economies through improved techniques and concentration of undertakings.

Payroll Reduced

The number of persons employed had fallen in the last two years by more than 600, while other internal economies had resulted in reduced operating costs amounting to nearly £500,000.

Additional revenue derived from the increase of 1d. a therm in the price of gas would be barely sufficient to meet higher costs during the present year, said Mr. Smith; though the yield in a full year would leave a modest margin. The Board hoped to hold the price steady until March, 1958.

SOUTH WEST HOPE TO HOLD NEW RATES UNTIL 1959

THE recently foreshadowed increase in the price of gas in the South Western Gas Board area will amount to an overall average of ½d. a therm or 6d. in the £1 on the gas bills of both domestic and non-domestic consumers.

Costs Up by £1 mill.

Announcing this to the South Western Consultative Council, Mr. C. H. Chester, C.B.E., Board Chairman, said: 'I am prepared to say that, provided there is no big increase in the price of coal or in wage rates, I will maintain the price of gas for three years or longer after the existing prices have been adjusted to take care of the recent increases in the price of coal and labour.'

Mr. Chester also said that in the last year since gas prices had been increased, after being held steady for three years, the cost of coal, labour, and materials generally had risen by nearly £1 mill. on a full year's working.

Increased Efficiency

Three-quarters of this increase would be met by increased efficiency from new works and methods, and also by foregoing any immediate hope of building up reserves. Only the remaining £250,000 would be raised by the increased gas prices.

The whole of the increase to the consumer would be covered in the standing charge and in the price of the first 30 therms, after that all the gas throughout the Board's area would be same price of 1s. 4½d. a therm.

'At this price gas is cheaper than coal or electricity for all purposes,' declared Mr. Chester.

THREE NORTHERN IRELAND TARIFFS ARE INCREASED

GAS supplied by the Belfast undertaking is to be dearer by 4½d. per 1,000 cu.ft. because of increases in wages, transport, and coal charges, which have added £159,000 annually to the working of the department.

The decision was taken at a meeting of the Corporation Gas Committee, and will cost the average domestic consumer approximately another 2d. per week.

Rising Steadily

The cost of wages and materials was rising steadily, Mr. J. L. Hyslop, General Manager and Engineer, told the Committee. Since the end of the last financial year there had been wage increases which would cost the department an additional £63,000 a year, while higher rail freight on coal would add a further £10,500 to outgoings, and increased coal lighterage and handling charges would cost £7,500. On top of all this, the increase in the price of coal of about 6s. 6d. a ton would place on the department a further burden of £78,000 a year. There was no alternative but to put up gas charges to meet these increased costs.

Mr. Hyslop said there was a deficit of £25,000 on the working of the department for the year ended March 31 last, and there would be a further deficit at the end of the current year.

The new charges would produce £53,000 this year, leaving the department to bear about £145,000 of the increased costs. In a full year the yield from the charges would be £98,000. The price of coal had increased to five times the 1939 figure.

For similar reasons the price of gas in Londonderry is to go up by 1d. a therm to 1s. 11d. a therm, while the price in Newtownards is to be advanced by 10d. per 1,000 cu.ft.

The retiring Mayor of Newtownards, Capt. J. McMorran, told the annual meeting of the Borough Council that the new price—7s. 10d. per 1,000 cu.ft.—would be among the cheapest in Northern Ireland.

Appliance Sales

During the past four years more than £76,000 worth of gas appliances had been sold, Alderman F. Logan told Bangor Borough Council. Alderman Logan is Chairman of the Council's gas undertaking.

The loss on the last year's working of the undertaking was £1,628, while there was a profit of £2,162 4s. 8d. in the previous year.

EDINBURGH WINNERS OF FIRST AID CONTEST

EDINBURGH No. 1 team won first place in a first aid competition at Granton gasworks, Edinburgh, when teams from gas undertakings in various parts of Scotland competed for a shield presented by the Scottish Gas Board.

The shield and other prizes were handed over by Mr. Sydney Smith, Chairman of the Board. The winning team will represent the Board at the annual inter-area gas board first aid competition in London later in the year.

Other teams competing included Perth No. 2 (runners-up), Edinburgh No. 2, Dundee, Perth No. 1, Hamilton and Airdrie.

Two Judges

The Judges were Dr. W. C. Sharp, one of Her Majesty's Medical Inspectors of Mines, and Mr. Andrew Morrison, Acting Secretary of the Edinburgh Executive of St. Andrew's Ambulance Association, and formerly Commandant of the Association's organization in Edinburgh. Dr. Sharp adjudicated in the team test, and Mr. Morrison in the individual tests. The incidents and staging were arranged by the Board's Medical Officer, Dr. D. G. Waddell.

Those present at the competition and the lunch which followed included the Deputy Chairman of the Board and Mrs. Burns, Mr. and Mrs. D. D. Melvin and Lord and Lady Mathers, the Secretary of the Board, Mr. A. T. Herd, the Chief Financial Officer and Mrs. Davidson, the Chief Engineer Mr. T. S. Ricketts, the Commercial Manager and Mrs. Bone, the Industrial Relations Officer and Mrs. Muir Murray, and the following Divisional Controllers and Group Managers and their ladies:

Chief Inspector J. W. Burgess, Commandant of Edinburgh City Police Section and Mr. P. Davidson, Commandant of Edinburgh Corporation Transport Section, were guests from St. Andrew's Ambulance Association.

Gas Consumption Debate

Bonnyrig and Lasswade Town Council have agreed to accept an invitation from the Scottish Gas Board to meet representatives of the Board for the purpose of discussing gas consumption. The meeting will take place on September 21.

CHANGE OF ADDRESS

The registered office and London departments of Stephenson Clarke Ltd., have been moved to the Company's new headquarters at 3, Great Tower Street, London, E.C.3 (P.O. Box 601); telephone, MANsion House 3270 (20 lines); Telegrams, Stephenson Clarke, Bilgate, London.

Five Receive Long Service Gifts

THE chairman of the Scottish Gas Board, Mr. Sydney Smith, on a visit to Uddingston gas works, presented gifts to three employees with 41 years' service. They were Miss Sarah McRae Scott, cashier since 1919; Mr. Charles Boag, works foreman at Cambuslang; and Mr. John Clark, chief clerk in the Hamilton and Motherwell district.

At a ceremony in Dunfermline Mr. D. D. Burns, Deputy Chairman of the Board, presented gifts to Mr. R. Brown, Dunfermline, and Miss M. F. Finlayson, Kirkcaldy, each of whom has 30 years' service.

Mr. Brown was a gas fitter in Dunfermline. Miss Finlayson served in the Kirkcaldy showroom as superintendent and was responsible for demonstrations, exhibitions, and pubilicity for 20 years. She holds the certificate of gas technology and was a member of the sales circle for many years.

GAS INDUSTRY PLAYS PART IN SCOTTISH WEEK

DESPITE limitations of scope the gas industry played its part in 'Scottish Week' which was observed in Scotland last month and was sponsored by the Scottish Chambers of Commerce.

Most showrooms ran the special window posters, and in some cases linked these with appliances made in Scottish factories.

The event is intended as an annual happening and from this year's experience it appears that scope exists for a major effect by the gas industry to publicize appliances as well as gas industry services, since the scheme is intended to be a fully representative one covering all Scottish products and services.

The Harris Engineering Co., Ltd., industrial heating specialists, of London, S.E.17, recently held a sales conference during which a visit was paid to the Willoughby Lane works of the Eastern Gas Board. Our picture, taken during the visit, shows some of the Harris sales force, together with Mr. A. H. Bird and members of his industrial staff of the E.G.B., Tottenham Division.

Gas Men Asked to Switch Allegiance

COMMENT BY CHAIRMAN OF SCOTTISH G.C.C.

SIR ROBERT NIMMO, Perth, Chairman of the Scottish Gas Consultative Council, commented at a meeting of the Council in Edinburgh that twice in the past six months, members of the Gas Consultative Council had been appointed to the electricity boards. They had thus been asked, as it were, to 'switch their allegiance from gas to electricity.'

He was referring to the appointment last December of Provost Robert Hunter, Musselburgh, to the South of Scotland Electricity Board, and to that more recently of Provost Alex. McRae, Dingwall, to the North of Scotland Hydro-Electric Board. Because of their appointments both Provosts have resigned from the Gas Consultative Council.

Minister Approached

Sir Robert said: 'We have come to form a kind of recruiting pool for the electricity boards.' He had spoken personally to the Minister of Fuel and Power about this matter and suggested that they leave it at that meantime.

Arising from a report of the Glasgow and West District Committee, Sir Robert informed the Council that under the Gas Act the Board could not give preferential treatment to any class of consumer, such as old age pensioners.

S.W.G.B. Try Out New Production Methods

DEVELOPMENT IN COLLABORATION WITH WOODALL-DUCKHAM COMPANY

DEVELOPMENT work in connection with the economic combination of various processes and plants hitherto largely untried in the British gas industry is now being pioneered by the South Western Gas Board in conjunction with Woodall-Duckham Construction Co., Ltd.

This firm is now installing at the Gloucester works of the Board the first British installations of W-D/Gasmaco high B.Th.U. oil gas plant (Hall process of the American Gas Association), and W-D/Koppers-Hasche reforming plant, as well as the second British installation of the W-D/I.F.E. complete gasification plant (G.I. system) similar to the one built at Kensal Green (North Thames Gas Board).

Used with Existing Plant

The new processes and plants outlined above will be used in conjunction with the existing W-D continuous vertical retort installation as well as with the Jones oil gas plant. Blue water gas will also be manufactured in certain circumstances.

By means of the above combination of plants the South Western Gas Board will have available a wide range of gases having specific gravities varying from 0.38 to 0.9 with calorific values varying from 300 to 1,000 B.Th.U. per cu.ft.

The programme of investigation work to be carried out in Gloucester will involve the exploration of the most economic combination of processes and plants to suit the local conditions.

Considerable work has already been carried out by Woodall-Duckham Construction Company in regard to the combustion characteristics of the various gases and mixtures of gases. The outcome of this development work will determine the nature of the further extensions at the Gloucester works, which is being laid out to accommodate a variety of processes with suitable mixing and pumping equipment for an ultimate capacity of 20 mill. cu.ft. of gas per day. It is confidently believed that, when completed, the result of these investigations will be of considerable value to the British gas industry.

First of its Kind

The W-D/Gasmaco high B.Th.U. oil gas plant will be the first of its kind to be built in this country. It incorporates the Hall process of the American Gas Association which was developed as a result of the Association's recognition of the limitation of the then existing oil gas processes in regard to their feedstock.

The Hall process, of which there are many examples throughout the United States of America, is now firmly established as a reliable and efficient means of producing oil gas from almost any liquid hydrocarbon feedstock.

Special Features

The plant to be installed in Gloucester will have a capacity in excess of 1 mill. cu.ft. of 1,000 B.Th.U. gas in 24 hours even when using feedstock of low quality. It will be of the latest two-shell type and will incorporate completely automatic operating equipment with the usual safety features. It is intended to operate the plant using a wide range of liquid hydrocarbons in order that the economics of the process may be firmly established.

The W-D/Koppers-Hasche reformer will also be the first example of this type of plant to be built in this country. It will be generally similar to the various plants in routine operation in the United States, but will include special features which are provided in order to meet the differing gas requirements of gas undertakings in this country compared with those in the U.S.A.

This reforming plant, which is suitable for either base load or peak load services, will be used in Gloucester for the reforming of both gaseous and liquid feedstocks under widely varying conditions of operation.

Latest Development

The W-D/I.F.E. complete gasification plant incorporates the well-known G.I. system which combines coal distillation with gasification of the coke residue in one generator. The new plant, which will have a capacity of approximately 2.5 mill. cu.ft. of gas per day, is of the completely automatic type, includes a self-clinkering, steam producing generator of the dry type in which high blast rates may be employed, complete oil gasification equipment and a waste heat boiler. Ancillary plant includes hot and cold electrostatic detarrers, condensers, and tar separators.

The gas generating plant, which incorporates all the latest developments and improvements resulting from Continental experience in the operation of numerous examples of this type of plant, will gasify a wide range of coals, most of which fall outside the range of these normally used in the British gas industry.

Western Juniors Take Trip Down River Dart

IN spite of dull and cloudy weather over 100 members of the Western Junior Gas Association and their ladies travelled to Totnes on June 16 to enjoy the programme arranged by the President.

The visitors were entertained to luncheon at the Seymour Hotel, where the President, Mr. D. J. Maunder, welcomed the ladies.

After lunch, the party embarked on a launch for the trip down the River Dart to Dartmouth where they visited the Britannia Royal Naval College, and were afterwards entertained to tea in the pavilion on the sports field.

The return to Totnes was by coach through some of the glorious South Devon countryside.

Publicity Catalogue

THE Gas Council Publicity Catalogue, just received, provides detailed particulars of the advertising and relevant media of the Council for the specific phases of the national publicity work conducted on behalf of the industry. Contents are classified under the headings, advertising; books; booklets, leaflets, and sundries; coke publicity; and exhibitions.

When he left to take up his appointment as Distribution Engineer, Southern Gas Board, Mr. F. Bell (Distribution Engineer, Liverpool Group) was presented with a camera by his senior group colleagues. In this picture, left to right, are Mr. Frank Fisher (Sales and Service Manager), Mr. W. S. Hubbard (Production Engineer), Mr. J. G. O. Drake (General Manager) Mr. Bell, and Mr. W. Hyde (Accountant).

Gas Liquor Featured in Agricultural Show

S.G.B. PUTS ON GOOD DISPLAY AT POOLE

FOR the first time at any agricultural show gas liquor was featured by the Southern Gas Board in a special display at the recent Royal Counties Show at Poole, Bournemouth. The display was centred round one of the large road tankers which carries the liquor to the farms, and a spraying bowser of the kind largely used for application of the liquor.

Around this equipment were grouped show panels, samples of liquor, photographs, descriptive literature, prints of an article on the subject, and captions explaining the qualities, composition, and uses of the material, together with a large map of the Board's area showing the principal concentrations of users and the list of approved spraying contractors.

Mr. Therm Aloft

Surmounting the display and visible over a wide area of the showground was a tall mast carrying a big red Mr. Therm and a slightly smaller Old King Coal in the form of a revolving weather vane, and below this a wooden pennon bearing the words 'Nitrogenous Liquor'—also visible from some distance.

The display aroused considerable interest, drawing many enquiries from farmers and spraying contractors—some outside the Gas Board's area. It is the Board's intention to take the exhibit to several other agricultural shows this season.

The display was to be commended, but it is suggested, on the strength of considerable experience of shows of this kind, that the use of scale models in place of the somewhat cumbersome equipment shown at Poole would save stand space and allow more room for photographs and supporting publicity.

There may also be a case for transferring the grass drying exhibit, from the domestic and commercial gas stand and showing the model grass drier in conjunction with liquor spraying equipment to the same scale—there is an obvious tie-up: 'Dress your grass with gas liquor and conserve it with coke-fired drying plant.'

Exterior view of the Southern Gas Board stand.

Domestic and Industrial Exhibits also Shown

The Southern Board had, in addition, an excellent domestic and industrial display at the Poole show. The wide range of exhibits were housed in a large marquee occupying a site close to the main entrance to the showground. Indeed, gas was almost the first thing that caught the visitor's attention.

The stand was divided into three main sections—25% domestic, 25% commercial, and 50% industrial. It may come as a surprise to many that Bournemouth and its immediate neighbour, recognized as a health resort and residential area, has a 12% industrial load, much of it concerned with pottery and ceramics by reason of the special virtues of the local Dorset clay. One such firm, indeed, uses as much gas as a city the size of Salisbury.

'Live Appliances'

All the principal appliances on the stand were 'live,' a main having been laid some 200 yds. to the showground from the nearest point on the distribution system. Thus the automatic control and ignition of a wide range of equipment could be demonstrated. Of special interest, being closely connected with the subject of the show, were a steam sterilizing plant for dairy utensils, a greenhouse heater set in a real greenhouse, and the now familiar Slade-Curran model grass drying plant supported by examples of its products—baled dried grass, grass meal, and cubes.

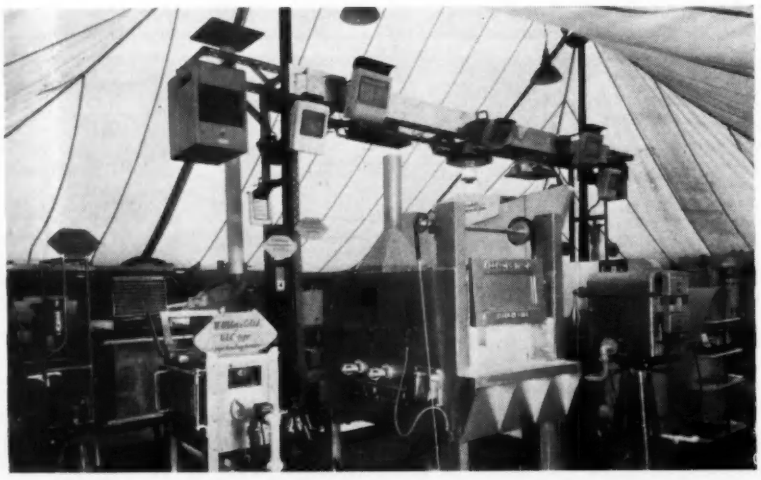
Particularly interesting was a gantry across the centre of the marquee carrying 17 examples of overhead gas heating apparatus. One of these was automatically controlled to turn itself on and off every 15 seconds.

On the industrial side were core drying unit, pottery kiln, infra-red tunnel with examples of the kind of products treated and the time saved by comparison with former methods, and an interesting range of high-pressure and other industrial burners. The operation of thermostats and flame failure devices was also demonstrated.

Home Service

The home service side was well to the fore. Indeed, the stand had an attractive 'shop window' in the front containing examples of simple everyday cakes, pastries, and preserves prepared with the help of gas.

Nearby was a demonstration gas washing machine with perspex front to show just what goes on inside when the clothes are being washed. Altogether a display on which the Board is to be congratulated.



Part of the industrial section of the Southern Gas Board display.

JOHN BREILLAT. 1770-1856

A Pioneer of Gas Lighting

By A. E. BALLARD

JUST a hundred years ago there died in Bristol one of the great pioneers of the gas industry, a man of far-seeing vision, great tenacity of purpose, and outstanding powers of organization. John Breillat, who was born in 1770, came of a French Huguenot family which had settled in Bristol during the religious troubles of the preceding century. He was a dyer by trade, but like many of his contemporaries, he was also a keen amateur scientist. He was particularly interested in the experiments which had already been made in coal gas lighting, notably at Boulton and Watt's Soho Works in Birmingham.

In London in 1807 private enterprise had been responsible for the illumination of part of Pall Mall by gas. Breillat went a step further. He maintained that an entire city could be lit by this new illuminant. The first thing to do was to arouse public interest. Not only did he light his own house in Broadmead—one of the principal streets in Bristol—he invited the public to come and see it and listen to a free lecture on how it was done. The *Bristol Gazette* for September 6, 1811, carried this advertisement:

Lecture and Exhibition of the Gas Lights

J. Breillat respectfully informs the Nobility, Gentry and Public that he intends for a short time to exhibit every evening at his own house a specimen of the above interesting discovery, accompanied with a descriptive lecture, this present evening, Thursday, at 7 o'clock.

Shortly afterwards, Breillat, still by way of advertisement, erected and ran at his own expense a few gas lamps in the street. How much light Breillat's lamps gave we have no means of knowing, but in comparison with conditions elsewhere in the city the new gas lighting must have been as novel and as dazzling as the first experiments with floodlighting more than a hundred years later.

At the beginning of the nineteenth century, when Bristol was second only to London in size and importance, the corporation refused to spend more than £26 12s. on street lighting. Queen Square, the largest in Europe, and at that time the most fashionable residential area in the city, boasted four oil lamps. There were four more at the Drawbridge in the centre of the city, and three outside the Council House. Elsewhere those few people who were obliged to walk through the streets after dark were dependent for illumination on the moon, a very occasional coach or sedan chair with attendant link-men, and the smoky oil lamps which householders were supposed to maintain outside their premises.

The bow-windows of the shops, if they were open after dark at all, were lit by one candle. When a certain shopkeeper used an extra candle to display some new goods, scandalized rivals prophesied certain ruin as a punishment for gross extravagance!

Unfortunately, Breillat's pioneering spirit was not shared by many of his fellow citizens, and his efforts to form a company to extend his own enterprise met with every kind of opposition. The uneducated were afraid of the new illuminant; the man who could create such a blaze of light must be in league with the Prince of Darkness! The middle classes had used tallow candles and oil lamps all their lives, and could see no need for anything better. 'Superior' people regarded the worthy dyer as a charlatan.

Business interests were also against the new gas because they saw in it a threat to the whaling industry, whose prosperity depended largely on the market for lamp-oil. When it was proposed to erect gas lamps in the streets of London, Sir Humphrey Davy, who had himself experimented with a very different type of gas in Bristol, asked whether the promoters intended to convert the dome of St. Paul's into a gas holder!

Nevertheless Breillat succeeded eventually in forming a syndicate and scraping together the very modest capital of £5,000.

On December 15, 1815, the Bristol Gas Light Company came into being. Works were erected in the neighbourhood of the present Temple Meads Station, under the direction of John Breillat, who naturally became the first engineer. Gas meters had not yet been invented. The charge for light, at the rate of 15s. per 1,000 cu.ft., was by contract based on the size of the burner supplied and the hours of use. There were only three types of burner: the Jett, three holes; the Argand, eight holes; and the Batswing, 15 holes. Prices per annum of 313 days were as follows:

Time of Use	Description of Burner		
	Jett	Argand	Batswing
	£ s. d.	£ s. d.	£ s. d.
Sunset till 8 o'clock	1 0 0	2 0 0	3 0 0
9 ,, ...	1 6 8	2 13 4	4 0 0
10 ,, ...	1 13 4	3 6 8	5 0 0
11 ,, ...	2 0 0	4 0 0	6 0 0
12 ,, ...	2 6 8	4 13 4	7 0 0
Sunrise	3 10 0	7 0 0	10 10 0
Two hours extra once a week ..	0 3 0	0 6 0	0 9 0
Two hours in the morning before sunrise during the six winter months	0 15 0	1 10 0	2 5 0

'An addition of one-sixth to the above prices will be made if the Gas is burnt on Sundays.'

N.B. The charge for a Summer Quarter will be one-eighth, and for a winter quarter three eighths of the annual price.'

Among the conditions which the consumers had to agree to observe were the following:

'To pay a rental of at least forty shillings per annum and be responsible for all gas consumed on their premises.

Not to burn the gas after the hours paid for. If the lights are used half an hour after the time, the consumer will be charged up to the following hour.

Any person desirous of burning gas in the morning before sunrise will be allowed to do so on agreeing to pay a fair price for the same, but if the light is used without agreement they will be charged as though they had burnt it all night.

The Company reserve to themselves the exclusive right of supplying the burners and of repairing them when necessary, payment for which to be made on demand.

No customer shall open or bore or permit to be opened or bored any burner supplied by the Company, so as to acquire a larger flame than was yielded by such burner when originally fixed . . . The servants of the Company to have access at all reasonable hours to inspect the lights.

N.B. The pipe supplying the gas will be cut off from the premises of any customer wilfully breaking these conditions.'

In order to check that gas was not being used during hours not covered by the contract, burners were only fitted in the front rooms of houses, and inspectors prowled the streets throughout the hours of darkness.

Indomitable Faith

During the first ten years of its existence the progress of the young Company was anything but smooth, and but for Breillat's indomitable faith and courage it must surely have foundered. Within a few months the Committee ran up against a major obstacle when the Aldermen refused permission to lay mains in the streets on the grounds that the gas holder (aptly nicknamed Aladdin) was too close to the city's gunpowder

(*Continued on p. 98*)

An abstract of a General Report presented at the 5th World Power Conference at Vienna

Preparation of Solid Fuels

By Prof. E. BIERBRAUER

BOARD OF THE COAL DRESSING AND PREPARATION RESEARCH INSTITUTE OF THE LEOBEN MINING COLLEGE

THIS review is confined to an examination of the various methods of preparation and conversion, especially from the viewpoint of the raw maetrial available. This is the uniform line to be followed; digressions are made where they are rendered necessary by exceptional cases. Rigid adherence to such a uniform line would, in any case, prove impossible owing to the close interlacing of the numerous problems of procedure. Nevertheless, it is necessary to draw this line in order to avoid duplication and to set up a well-defined aim for ensuing discussions.

The multiplicity of methods of preparation and utilization is equalled only by the multiplicity of ranks of coal. The classification butuminous and brown coal merely supplies a summary distinction according to superficial characteristics. A more detailed classification is called for not only because this is a scientific requirement, but also because it will facilitate the technological grading of types of coal. In view of the basic importance of a certain standardization according to distinctive technological features it would be desirable in the interests of an international exchange of knowledge if individual countries were to agree on a uniform system of classification and a uniform terminology that is generally understood. It seems advisable to preface this paper on the preparation and conversion of fuels with a few remarks concerning the efforts made to date to achieve a uniform system of coal classification.

Coal Classification

An important step towards the general target of international understanding has been made by the Coal Classification Working Party of the Coal Committee of the European Economic Mission. The coal classification system suggested at Geneva in 1952 is based on the content of volatile matter, on the agglutinating power and the coking capacity, that is on characteristics supplying information on the behaviour of the coal type when it is gasified, burned or coked. In this respect the system corresponds to others already applied in various countries. It has been set up on the pattern of a system of classification used in Great Britain, discussed at length at the Fourth World Power Conference (1950) in paper 4 of Section B. As under the English system, types of coal are specified by three-digit code numbers. These index figures have proved far more reliable in specifying a certain genetic or technological type of coal than have the proper names hitherto used in various countries.

As usual, the basic classification is made according to the content of volatile matter (dry, ash free basis), which is the customary classification by rank. Ten grades (0 to 9) are established, the calorific value of the dry, ash-free coal substance being used as evaluation factor as far as coal with more than 30% of volatile matter is concerned. The first figure of the code number refers to the class in which the type of coal concerned must be included. Thus, if the code number begins with the figure 9, the coal in question is highly volatile, the heat of combustion produced by it lies according to the standard table below 6,100 kcal. per kg. (11,000 B.Th.U.).

The second figure of the code number supplies information on the swelling index of the coal concerned. There are four groups of swelling indices (0 to 3). The group marked 0 comprises coal types with a swelling index of between 0 and 0.5, that is non-caking and non-swelling coal. Coal with strong caking and swelling properties, covered by swelling indices 4.5 to 9, are characterized by figure 3, while figures 1 and 2 are reserved for swelling indices 1 to 2 and 1.5 to 4, respectively.

The third figure of the code number supplies information on the caking power. This scale has six sub-divisions (from 0 to 5), which correspond to six different degrees of caking:

0—non-caking
1—practically non-caking
2—weakly caking
3—medium caking
5—strongly caking
6—coal with surplus caking power.

The swelling index is based on a comparison with numbered standard samples of coke buttons, and cover the range 0 (non-coking) to 9 inclusive, the last standing for the highest swelling index. Specification of caking power is based on the results of a dilatometer test or on the Gray-King carbonization assay.

Apart from the classification briefly described above, a uniform system of classification for commercial coal is also contemplated. This would constitute a desirable simplification since the exchange of varieties of coal among nations is steadily increasing. It is therefore to be hoped that the international coal classification to be tentatively introduced before the end of 1955, and the investigation measures to be based on this system, will soon be applied throughout the world.

Numerous examples can be given to illustrate the practical advantage of a uniform system of classification of this kind. For our purpose it will suffice to point out the usefulness for those countries which, like Japan (paper 'The Techniques of Coal Blending in the Japanese Coking Industry') or Yugoslavia (paper 'Industrial Processes for the Upgrading of Lignites') are forced by the lack of good coking coal to produce the coke required for their iron industry by blending different types of coal, partly of national and partly of foreign origin. An internationally accepted standard for designating types of coal by index numbers would be most advantageous also for the identification of coal deposits in any one country, facilitating comparison with other countries as is proved by the example of Turkey (paper 'Types and Principles of Classification of Turkish Coal').

Seventeen Coal Types

The fact that comprehensive information can be obtained by the application of this system is proved by paper 'Present Situation and Developments of Hard-coal Mining in Federal Germany' (i.e., Western Germany) on the present status and future development of the coal mining industry in the Federal Republic of Germany. In compliance with the international classification system set up by ECE in Geneva, total annual bituminous coal production within the area of the Federal Republic and separately of the Ruhr area is listed in the form of a breakdown according to coal types. Production comprises no fewer than 17 different coal types, each of which is designated by its own specific code number.

It goes without saying that the term 'technical suitability' covers considerably more than the characteristics according to which the coal types are classified under the system in question. However, this system merely aims at grouping the various coal types according to the individual properties of the organic matter, in so far as they result from the chemical composition and structure.

The extent to which the coal lends itself to preparation does not depend on its rank. On the whole, the amount, nature and distribution of the inorganic mineral substance are determined during the early stages of seam development. However, it depends on these individual conditions whether or not usable products can be obtained from a given raw coal. In order to characterize an individual seam it is therefore necessary not only to classify it according to its organic content but also to supply some information concerning its washability. This aim is attained by the washability curves of the Henry-Reinhardt diagram from the float-and-sink test. Accompanied by a petrographical examination of the structural elements, the Henry Reinhardt diagram supplies an excellent means for establishing seam correlation. This seam correlation has been started along uniform lines in several coal-producing countries.

Mechanical strength is an important quality in so far as it determines the size-distribution of the raw coal and the yield of grades. As long as coarser sizes fetch higher prices than smaller sizes, this physical factor will continue to have a basic influence on market value. Although it would appear from observations made in individual coalfields that high-volatile coal is harder than coal containing a smaller quantity of volatile matter, it is advisable to deduce a general rule from findings confined to limited regions. A strong argument against such a generalization is supplied by the fact that the same coal types have different geological histories in different deposits. We shall have to distinguish between overall strength resulting from geological conditions deciding the size distribution of the coal mined and the resistance to mechanical influences displayed by the coal when it is broken up and ground. Paper 'Some Experiences of Pulverizing Coal,' dealing with grinding problems of British types of coal proves that 'grindability' depends on rank. Such findings are significant in more than one respect. The paper refers to a systematic investigation of the grinding properties of 150 samples of different types of coal produced in Great Britain. This investigation was prompted by the fact that consumption of pulverized coal is steadily increasing; in Great Britain it rose during the short period between 1951 and 1955 from 8 to 19 million tons and is expected to reach 37 million tons in 1960.

Since a similar development in the consumption of pulverized coal can be observed also in other countries, knowledge of grindability and its connection with the rank of coal gains practical importance, in so far as it facilitates the choice of types of coal especially suitable for producing pulverized coal.

In a later section it will be shown how very important it has become for coke producers to obtain exact knowledge of the behaviour of the various coal types and their structural constituents in crushing and grinding.

Whether and to what extent the technological characteristics listed here and others not yet covered by the classification will allow of arrangement in a system depends on the results of further systematic investigations. The efforts made so successfully by various coal research institutions to improve the science of coal by numerous investigations (optical, chemical, petrographic, by electronic microscopy), allow us to expect most confidently further progress also in the solution of the 'type problem,' a problem of the highest significance from the viewpoint of the technology of coal and coal mining industry as a whole (papers 'Progress of Coal Treatment in Japan,' and 'Recent Research and Development in Great Britain in the Thermal Treatment of Coal').

Preparation

Preparation in the strict sense of the word covers the mechanical removal of the inerts contained in the raw coal and the grading into sizes suitable for sale. Thus, preparation is the connecting link between the mine and the consumer and therefore is affected by any changes taking place either in coal production or on the coal market. In both these fields, developments have started which have caused preparation to assume a key position. The quality of the coal produced has deteriorated owing to the fact that mining methods have been intensified and mechanized to a very large degree. Selective mining has been abandoned with the result that the ash content of run-of-mine coal has increased as well as the output of small coal, since the raw coal is now exposed to heavier stresses while being mined and loaded. Paper 'Recent Developments in the Preparation and Uses of Hard Coal' proves that in the Federal Republic of Germany—as well as in other European countries—refuse in the hard coal mines rose from 12.9% of gross production in 1936 to 23.9% in late 1954. These changes, partly caused by the rationalization of mining, involve new preparation problems which some of the old plants are no longer able to cope with. As regards the coal market, this is affected by another circumstance: coal has ceased to be the only source of power available, it must now compete with fuel oil, natural gas and water power, which are easier to handle and more adaptable.

As a result of growing competition, demands have risen when the quality of coal is concerned. On the other hand, the increasing preference for gas and electric power increase coal consumption in the field of gas and power production especially in those countries which are rich in coal but comparatively poor in other power resources. The comments made from the viewpoint of power economy in paper 'Present Situation and Development of Hard-Coal Mining in Federal Germany' (i.e., Western Germany) concerning the change observed in the utilization of coal in Germany since 1950 indicate the expansion in the production of high-grade energy.

Common Problem

Coal cleaning is fundamentally affected by these changes. The aim to be achieved is to produce at low cost and with a minimum of loss, high-grade coal from run-of-mine coal that has deteriorated in quality for the reasons shown above. Most of the coal mines in Western Europe are faced with this same problem, solution of which is the more difficult since the expenditure involved must be kept as low as possible. The two German papers, 'Recent Developments in the Preparation and Uses of Hard-coal' and 'Present Situation and Development of Hard-coal Mining in Federal Germany' (i.e., Western Germany) give a graphic account of the current situation. The same difficulties are encountered in all coal-producing countries in Western Europe, where geological conditions are similar. It is remarkable that, judging from reports submitted by non-European countries 'The Progress of Coal Treatment in Japan') the situation is pretty much the same there, too. Perhaps a single exception is the United States with its rich deposits favoured by unusual geological advantages for mining and preparation.

The general development of coal cleaning is marked by replacing hand-picking by the far less expensive mechanical separation. In this respect things have changed basically, for up to only a few years ago it was the general practice to hand-pick the coarse size and to use mechanical preparation only for coal less than 3.2 in. in diameter. In some plants, hand-picking is retained for coal sizes exceeding 6 in. or 8 in., and decreasing demand for sizes over 8 in. promotes full mechanization. More and more cleaning plants are going over to breaking up the largest lumps to 8 in. and to washing these together with the natural lump sizes of raw coal under 8 in.

The Bradford breakers which operate like a rotary screen preferably crush the softer coal, which drops through the 8 in. wide holes of the drum, while the waste is held back and carried out. The process of selective crushing finds increasing application also in other fields of mineral dressing, by using percussion-breakers and mills. An effectual separation by crushing and screening can be achieved only if the materials to be separated offer different degrees of resistance to the break-up process. Experiments made with Bradford breakers in various West European plant have shown that the condition of the coal there is not so favourable as in the United States.

For coal cleaning, heavy-medium separation is steadily gaining ground. This process, known for some time, has been so much improved in technical and operating details that former objections are no longer justified. Its precision of separation is greater than that of all other processes. Moreover, the dense-medium washer can handle even the largest lumps and thus satisfies the need for the complete or partial mechanization to replace hand-picking. Some of the more recent separators, such as the Drewboy developed in France, can handle pieces of up to 1 ft. 8 in.

As regards the problem of fine coal preparation—involving sizes less than $\frac{1}{5}$ in.—by heavy liquids, opinion is still at variance, but some plant has given good results when using various types of dense-medium washers for separating fine coal in the size-range of .4 in. to .04 in. Further progress may confidently be expected from the cyclone washer.

A most impressive picture of the present state of heavy

liquid preparation was disclosed at the Second Conference on Coal Preparation held in Essen in September, 1954. Of about 70 technical papers given there, one third, at least, dealt with problems of heavy-liquid preparation.

Less up-to-date equipment, such as trough washers, Rheolaveurs, pneumatic cleaning by air jigs and air tables as well as most of the less well-known processes and machines have practically disappeared from Western European coal producing countries or are applied only in a few exceptional cases. Jigging, on the other hand, has easily succeeded in holding its own. Compared with the heavy-liquid washer it offers the advantage of a very wide range of operation: It can treat coal from .013 in. to 3½ in., or even 6 in. Further, efforts have been made to improve precision of jig-separation so that this method can still compete successfully with heavy-liquid washing.

Today, the predominance in this field lies with the Baum-jig, so called in most countries after its German inventor. Thanks to various improvements made to the reciprocating action, the automatic discharge and the jig plate, this machine is in many cases still able to meet the higher demands of the quantity and quality in coal washing. Thorough investigations are therefore required before it can be definitely stated in any one given case whether preference should be given to dense-medium washer or to a jig. As a rule, equipment and operation costs are lower for jigs. A saving of cost may therefore counterbalance smaller returns due to the lesser precision of separation. The question of larger or smaller returns leads to the difficult problem of how to ascertain the exact yield of these two processes. Today, this problem is usually solved by calculations with the aid of Tromp's partition curves and washability curves, based on float-and-sink test of the coal to be examined.

In General Use

In this context it should be pointed out that these methods, which until recently were disputed at technical meeting, have become really useful, though certain details will yet have to be clarified. Today, they are in general use, as can be seen also from several papers submitted to this Conference, for example, paper 'Washing Lignite (Brown Coal)'. It is therefore highly gratifying that the various new concepts, such as partition ratio or distribution number, effective separating gravity, etc., have been standardized.

In the field of coal flotation, no fundamental innovations have been made. The number of flotation plants has increased at least at the Western European collieries, since the fines content of raw coal has increased. A problem linked with heavy-liquid washing, which remains to be solved, is the question of how to include in the preparation process those sizes which are too large for flotation but too small for the dense-medium process. The jig has the great advantage that its size extends to the range of flotation procedure and thus renders it unnecessary to interpolate a third process.

The well-known difficulties experienced in flotation when processing slurry rich in clay are now overcome by means of a procedure developed in the Ruhr mining industry, which is known as the 'Convertol' process (paper 'Recent Developments in the Preparation and Uses of Hard Coal'). This process is based on the fact that coal and dirt react differently when brought into contact with water and oil. Thus, an admixture of oil causes the hydrophobic coal particles to coagulate, while the dirt particles continue in a state of dispersion. After this preparation, the water containing minute clay particles is removed on centrifugal screens. The residue is a coal concentrate which, compared to the filtered flotation product contains 5% to 10% less water and can easily be apportioned and blended with coking coal.

The deterioration in the quality of raw coal caused by the increased percentage of fines renders it necessary to follow lines also in the field of dewatering. Thus it appears advisable, in order to improve draining, to eliminate the fine sizes. According to K. Lemke, an admixture of wetting agents facilitates draining and mechanical dewatering. More detailed information is furnished in paper 'Recent Developments in the Preparation and Uses of Hard Coal' which is concerned with the important effect on preparation techniques, exercised by the increase in the water content of raw coal caused by the dust-suppression measures in the collieries.

It will presumably prove impossible to use, as hitherto, dry screening and pneumatic de-dusters. This will entail far-reaching changes in the pre-screening sector. Thus the coal will either have to be dried thermally and then classified by size as has been customary up to now, or dust extraction by dry methods will have to be abandoned in favour of rinsing screens.

The large central washing plants with their steadily increasing output are the natural consequence of concentrating mining and haulage. Where different types of coal are mined, the economic principle of mass production gives rise to a series of problems, especially when the raw coal is used for coking. This means that the washery must be equipped to meet specific conditions of further treatment of coal even if such operation is not in keeping with the rule of cheap mass production.

Since the amount of waste in the run-of-mine coal has been increasing considerably, it was suggested that the waste should be removed in the mine itself, by mechanical pre-cleaning. This would mean replacing the former manual cobbing at the coal face. Considering that at present medium mining depth of the Ruhr collieries has reached 766 yards, and that, according to the paper 'Present Situation and Developments of Hard-Coal Mining in Federal Germany' (i.e., Western Germany) this depth will be increased 50 to 70 yards within the next ten years, it is certainly essential to disencomber hoisting by underground pre-cleaning of the run-of-mine coal. In a lecture delivered at the International Mining Congress (Paris, 1955), J. Venter has drawn a picture of the situation in which the European coal mining industry will presumably find itself in the year 1975. Venter based his comments on the conditions at present prevailing in the Belgian collieries, which even today are the deepest mines of coal in the world. In view of this indisputable fact, Venter arrives at the same conclusion and suggests the same course. According to him, it should be possible under the conditions at present prevailing in Belgium, to achieve a 25% increase in the output of coal conveyed underground simply by removing at least part of the dirt from the coal within the mine itself. This pre-cleaning would have to cover only large pieces of more than $\frac{4}{5}$ in. and could be carried out by means of Bradford breakers, percussion breakers and heavy-medium separators.

Easily Worked

All these difficulties are entirely unknown in the coal mining industry of the United States. Even today, about one fifth of the overall production is won by open working, while most of the deep mines are still worked as drifts. The seams are mostly flat and hardly ever broken; they have just the right thickness to be easily worked. Therefore, labour can be replaced by cutting and loading machines to an extent which can never be attained in Europe where stratigraphic conditions are far less favourable because of irregular and difficult seams. The abundance of coal in the United States makes it possible simply to disregard poorer seams, although the seams are, as a rule, distinguished by a high degree of purity. Consequently, a large percentage of the run-of-mine coal can be sold without cleaning. In 1950, not more than about one third of the coal produced required preparation. True, in some fields the quality of the coal is not quite so good. However, for the American coal mining industry as such, preparation plays a comparatively moderate part. This is one of the reasons why preparation methods and machines differ so widely in the United States and range from an extensive up-grading of the raw coal with the very simplest means to highly developed systems of intensive washing according to the European standard.

Thanks to the cleanness of raw coal, its good washability and the low mining costs, the choice of procedure in the U.S. is not limited by considerations of precision of separation. Therefore, other viewpoints, such as simplicity, low plant and operation costs, may have a greater influence on flow sheets and equipment. This is the reason why washers like the Rheolaveur, pneumatic jigs and tables, machines utilizing shape, frictional resistance and differences in resilience, wet tables, and numerous other devices, which partly seem somewhat historical, can still be seen in operation side by side with the most up-to-date heavy-medium washers and Baum-jigs.

The manner in which the economic structure of a country and its geographical situation affect production and the up-grading of its coal deposits is shown in paper 'Some Economic Aspects of Coal Production and Utilization in the Union of South Africa' on the Union of South Africa. Here, freight costs represent the largest financial charge, whereas mining

costs are low owing to the favourable geological conditions. Up to now, preparation has been confined to a separation of the raw material (by means of jigs) into commercial coal and refuse, which latter contains a fair percentage of middlings, according to the disseminated character of the coal. It is intended in the near future to start three-product separation, so that on the one hand the high freight costs will henceforth be partly counter-balanced by the higher price that can be charged for better coal, while the large volume of middlings coal can be used in the colliery for power production.

In recent years, the practice of mechanical cleaning has been gradually extended also to brown coal. Bright brown coal, closely related to bituminous coal, had for a long time been a model of mechanical upgrading. An innovation in this field is the heavy liquid separation of lignite, such as has been applied in Yugoslavia 'Industrial Processes of Lignite Refining.' Paper 'Washing Lignite' (Brown Coal) on the establishment of a brown coal dense-medium washing in the Komorany district in North Bohemia, shows up the difficulties of washing brown coal resulting from the high clay content of the raw coal and proves that the experience gained in bituminous coal preparation cannot be applied to brown coal without careful previous investigation of all the factors concerned. As a rule, preparation of lignite is confined to sizes greater than 10 or 20 mm., in accordance with economic considerations.

Briquetting and Drying

Considering the increasing demand for quality in solid fuels caused by growing competition, the shape of coal becomes another important factor. Briquetting therefore plays today a greater rôle than hitherto. Coal briquettes are always produced with coal-tar pitch as a binder. The foremost problem to be solved in this field and at present the subject of extensive investigations, is to reduce the pitch consumption, usually 6% to 7%. Numerous efforts have been made to achieve an appreciable reduction of this figure; the use of aqueous pitch emulsions appears to be the most promising, a procedure which is still in its experimental stage.

In Japan, briquettes of coal and brown coal blended are produced, requiring up to 13% of pitch. As can be seen from paper 'Progress of Coal Treatment in Japan,' strong efforts at economy are being made there, too. Of first importance for this country is the production of smokeless briquettes for domestic consumption. It is interesting to know that briquettes have recently been manufactured in Japan from semicoke, with sulphite liquor as a binder. Although utilisation of this waste liquor for briquetting has long been known, there is little information about the commercial application of this binder.

In Great Britain, thermal treatment of coal briquettes produced with pitch was introduced some time ago to supply a smokeless fuel which under the name of 'Phurnacite' has gained great popularity among British householders.

The old problem of a smokeless fuel which is of primary importance for the British coal industry has recently acquired a new urgency since in the next ten or fifteen years the task is to replace 19 million tons of the bituminous coal consumed in the densely populated areas by solid smokeless fuel, gas and electricity. Since it is assumed that this change-over will have to be based primarily on supplies of solid smokeless fuel, British coal research is much concerned with trying to solve the problem of how to produce such fuel ('Recent Research and Developments in Great Britain in the Thermal Treatment of Coal'). Several methods have been developed whereby smokeless briquettes can be produced from coal of lower rank. This coal has to be used, because coal with a low volatile-matter content is becoming scarce. Unlike Phurnacite, which is made from smokeless coal, the basic material of the new fuel must first be carbonized and the briquettes made of semi-coke with pitch subjected to yet further thermal treatment. Research has been directed in the first place to fluidized carbonization, while thermal treatment of the briquettes will be achieved by using hot sand in a fluid or mobile bed as the heating medium. This direct heating method has the advantage over that applied in the production of Phurnacite when briquettes are heated in retorts, of ensuring continuous operation and a very rapid transfer of heat. By blending the pitch with certain substances it is possible to alter the binding power to such an extent that even briquettes of uncarbonized coal with a high volatile content can stand carbonization without distortion or fusion. A third method provides for the coal being briquetted without a binder and the briquettes being subjected to carbonization. The paper referred to points out briefly that in the course of these experiments a new type of press was developed which is expected to make the briquetting of practically any type of coal possible, without a binder. Somewhat surprising is the remark that with this new method a pressure will suffice which is much lower than that used in Germany to briquette earthy brown coal without binders. It follows from this that the new type of press will be able to briquette bituminous coal, too, by applying a pressure of less than 1,700 lb. per sq. in., and without requiring binders. The experience gained hitherto all proves that a very much higher pressure is necessary, which entails difficulties in the operation of the press as well as complicated and costly types of construction. Some time ago experiments with the ten Bosch press (7,095 lb. per sq. in.) were done by the German coal industry. Some possibility of briquetting bituminous coal without a binder under a low pressure is offered by the various thermo-plastic procedures. However, judging by experiments done hitherto, the hot-briquetting method can —at least in its present stage—be applied to only a very few types of coal.

It would be highly desirable were the experiments currently made with the new press to be successfully concluded within the near future so that the experts interested in this development could be informed in greater detail. There is no doubt that we have here a revolutionary innovation which is bound to have a tremendous influence on future up-grading techniques.

In the field of brown coal briquetting without binders, such as it is done especially in Germany, a development in the German Democratic Republic deserves notice; it has led to the production of high-temperature coke blocks from brown coal briquettes for metallurgical and chemical purposes. ('Present Situation and Developments in the German Brown-Coal Industry.')

As regards construction of briquetting presses, ever-increasing importance is attached to the evolution of high duty roller presses for nut sizes owing to the increasing demand for nut briquettes. The advantages of the ring-and-roll press attract attention as is proved by several new designs.

Close Connection

A close connection exists between the briquetting of brown coal and the drying process. In order to obtain sufficiently consolidated briquettes from earthy brown coal, briquetting coal must be dried until the water content offers optimum technical conditions for briquetting, equivalent to about 15% to 20%. The improvement of the briquetting quality of this coal therefore automatically also increases the calorific value. A modified process of briquetting without a binder, at present under large-scale technical trial in Austria, may also be applied to lignitic brown coal. This process is yielding briquettes of high calorific value even from lignitic brown coal, which in the natural crude condition is of coarse-lump structure, but crumbles under ordinary drying. The drying of lignitic brown coal while its lump character is preserved is possible by the established Fleissner process, which effects drying by superheated saturated steam at about 20 atm. The first Austrian plant working on this system, constructed in the Köflach area in 1924, was recently replaced by a new plant producing dry coal of about 15% to 18% residual water content from crude coal of 40% water content. The new plant operating 16 boiler units has a daily capacity of 2,500 tons of dry coal. Re-use of the steam for drying has reduced steam consumption in this plant to 0.5 lb. per lb. of water extracted. The plant in Kolubari, Yugoslavia, already mentioned above, is operating on a similar basis ('Industrial Processes of Lignite Refining'). As a special feature in this plant, lignitic brown coal is first cleaned by dense medium process.

For various reasons, raw material problems have assumed first importance in the field of producing metallurgical coke. The question, how to produce coke of suitable quality from non-coking or weakly coking coal, has been agitating not only those countries which, like Yugoslavia ('Industrial Processes of Lignite Refining') or Japan ('The Techniques of Coal Blending in the Japanese Coking Industry') are dependent on coal of more or less unsuitable quality, but also those countries where up to now, coke production was based on the availability of exceptionally good coking coal. Owing to the fact that in the latter countries mining activities were chiefly

concerned with this good coking coal, it has now become necessary in coal-producing countries such as Great Britain ('Trends in Carbonization Practice and Research in Great Britain With Special Reference to Coke Oven Plant') or Germany 'Recent Developments in the Preparation and Uses of Hard Coal' and 'Present Situation and Developments of Hard-coal Mining in Federal Germany' (i.e., Western Germany) to use less suitable coal also, to widen the range of coals or to cope with unpropitious blends resulting from certain technical and other measures taken by the mining industry. Some of these blends have nothing in common with the ideal type of a good coking blend used so far, with its homogeneous good quality. This lack of homogeneity in the quality of the charge naturally causes great fluctuations in the quality of the coke produced. These variations are presumably one of the reasons why of late the iron and steel industry has started to clamour for coke of homogeneous quality, since it has been realized that, for the operation of blast furnaces, a steady uniformity is far better than peak values of changing character.

The blending of suitable basic materials as to type and quantity is the basis of coking-coal mixtures. By analogy with the burden in blast furnaces, this blend could well be called a chemical mixture, since the chemically conditioned smelting reaction of the constituents is decisive in the selection and adjustment of coal types. Today, the burden as a chemical system can draw on much scientific and practical experience. Further progress may be confidently expected from investigations made in Great Britain, concerning the relationship between fluidity and chemical composition ('Recent Research and Developments in Great Britain in the Thermal Treatment of Coal').

In combination with the microscopic examination of coke these research activities justify the hope that in a not too distant future empirical rules will be replaced by scientifically controlled blending. Such a development appears the more desirable as the quality of coke depends primarily on the raw material processed.

The ratio of the grain sizes of the different coal types contained in the blend is of equal importance as are chemical factors. Regulation of this physical aspect of the raw material might well be called 'physical mixing' after the well-known expression used in blast-furnace operation.

It is of some interest that the practical significance of the physical mixture for blast furnace operation was realized much later than that of the chemical mixture. A certain analogy can be observed also in the sequence of developments in coking, at least where practical application is concerned.

Considerable progress has been made in the field of physical mixing with the Longwy-Burstlein procedure of selective and petrographical preparation. This process was developed in Lothringia, where for a long time past coke production has been coping with considerable difficulty as to raw materials —as in the Saar. The many efforts made to use the coal mined in Lothringia were described in a report submitted to the Fourth World Power Conference by J. L. Sabatier.

The procedure referred to, which is most cleverly adapted to the raw material difficulties occurring so frequently nowadays, makes use of the fundamental knowledge collected in coal petrography as a result of the research work carried out by the coal industry in West Germany.

When ground in the usual manner, a fine-coal blend furnishes particles that differ not only in quantity and particles size, but also in substance. This is proved by a finding which Abramski made when he examined a blend containing gas coal and low-volatile coal crushed in a hammer mill. He found that the softer and strongly caking particles of the gas coal had been broken up more than necessary, whereas the particles of the weakly low volatile coal as well as the equally hard and weakly caking particles of the gas coal were as large as before. It follows from this that in the usual grinding process a size distribution is achieved which is most unfavourable from the viewpoint of coke. By applying the selective grinding method of the Burstlein process this disadvantage is avoided. Prior to grinding, the material is screened and the screen overflow is ground in closed circuit to the size of the primary particles, which have passed the screen without being ground. The mixture of these two products gives a well prepared blend for coking.

The grinding process itself is operated gently so as to avoid a harmful yield of dust. This ensures not only a high degree of uniformity in the substance, but also makes for a very dense charge for the coke oven. According to the coal types used, the process can be varied and closely adapted to the exigencies of individual cases; all this is described in detail in the paper mentioned. The new process is applied in large-scale production by several coking plants (Thionville in France, the Consolidation colliery in Germany, the gasworks at Oran in Algeria) and, judging by the results achieved hitherto, represents a most efficacious auxiliary means whereby to overcome coal difficulties.

It goes without saying that a blend of non-caking coals can never be made caking even by using the methods of physical mixing. But selective milling may help to attenuate the fraction of coking coal in favour of the weakly caking coal without reducing coke quality. On the other hand, quality can be improved in the case of a given mixture by regulating the bulk density of the coal charge. Physical and chemical mixing doubtless constitutes an indivisible unit and it would be an idle question which of the two is the more important. Appropriate mixing will facilitate even the production of special coke types, such as a foundry coke with low reactivity and low bulk density, or a coke suitable for the British open fires which require a very highly reactive fuel ('Trends in Carbonization Practice and Research in Great Britain With Special Reference to Coke Oven Plant' and 'Coal Carbonization in Continuous Vertical Retorts in Great Britain').

A PIONEER OF GAS LIGHTING

—*Continued from p. 93.*

magazine. The general suspicious fear of the new lighting died very slowly. When the Gas Light Company offered to light the Commercial Rooms for the sum of £120 a year the members refused, although they were spending £140 a year on oil and candles!

One by one, however, all these difficulties were overcome, and by the end of the first 12 months £1,000 had been spent on works and mains, which now reached the centre of the city. One of the most surprising enterprises of the Gas Light Company was the compression of gas into small iron cylinders 18 in. long by 6 in. in diameter and their delivery to houses beyond the range of the existing mains—anticipating a modern practice by more than a century.

After two years the number of consumers had risen to 142. In 1819 the Company was incorporated, with a capital of £50,000, and the works were removed to a more convenient site. The new gas holder, of 43,000 cu.ft. capacity, was the largest then in existence.

Meanwhile, a process of making gas from oil had been evolved, and in 1822 a rival, the Bristol and Clifton Oil Gas Company, was set up with works at Canon's Marsh, on the western edge of the city. Powers similar to those held by the original Bristol Gas Light Company in regard to the opening of streets, etc., were granted, but all pipes and mains laid by the Oil Gas Company were to be marked with a reed or groove on the upper surface, and were to be laid not less than 3 ft. 6 in. from any other gas or water pipe. In spite of these precautions, however, it was possible, through mistakes in connecting, for one company to supply the gas and the other to receive the rental!

The charge for the new oil gas was much higher than for was claimed that its illuminating power was four times greater, and that it was free from the disagreeable smell which the coal gas—40s. per thousand cu.ft. compared with 15s.—but it critics of the original gas never failed to point out.

The final outcome was the amalgamation of the two companies in 1853 under the title of the Bristol United Gaslight Company, changed to Bristol Gas Company in 1891. In 1856 the central offices were moved to the oil company's premises in Canon's Marsh.*

In the same year John Breillat, who had guided the enterprise through 'teething troubles' to final triumph, died in harness at the ripe age of 86.

* Moved to Colston Street, adjoining the Tramways Centre, in 1907.

Peak Load Therms from Low Boiling Point Hydrocarbons

By *J. D. GRANT*, M.A., Assoc.M.Inst.Gas E.
North Thames Gas Board.

THE paper deals with some full-scale trials at Fulham, during the winter of 1955-56, with the object of providing additional peak load output with the minimum of capital expenditure and labour. During the trials benzole was used but certain additional calculations provided are based on the butane installation to be made at Fulham for the same purpose. At the same time information was obtained which would be of use in correcting calorific value, after maximum benzole extraction with the object of improved removal of organic sulphur.

In 1952 Dr. J. Burns drew attention to the enormous cost of a peak load therm. For an increment of 10% on one day per annum in the space heating load a cost of 162.5d. is quoted with an average day temperature of 21°F. The average for February 1, 1956, was 21.5°F. A peak load oil gas therm is quoted as 16.19d. for a 77 days per annum load at 1952 prices. The peak load oil gas therm adjusted to December, 1955, prices is 14.513d. But adjusted to a 14 day per annum load the cost becomes 23.6d.

The increase in the cost of capital installations and the increase of labour cost since 1952 have increased the desirability of finding a means of providing a peak-load gas. This does not take into consideration the difficulty of providing a labour force to operate a peak load plant for a few days a year.

At Fulham the combination of gasmaking plant is such that it would not be possible to run the benzole washing plant to the necessary degree and further to reduce the organic sulphur content without endangering the declared calorific value. This, however, could be achieved by putting partially refined benzole back into the gas. A common method of increasing the output for short periods is to by-pass a benzole washing plant but this is limited to the amount of benzole in the coal gas and has the disadvantage of not removing any organic sulphur. In addition, where a benzole plant is used for naphthalene washing there is the danger of naphthalene difficulties on the district.

To overcome these objections the simplest means is to inject refined benzole or some other suitable hydrocarbon into the gas stream. As a first stage the existing storage capacity of the benzole plant can be modified for the storage of refined benzole —the injection system is simple and quickly installed. Taking a longer view, butane satisfies the necessary conditions and is cheaper, but requires the installation of special storage equipment, a more lengthy and more costly project.

Description of Plant

The use of partially refined benzole for injection purposes requires the approval of the Commissioners of Customs and Excise. In the administrative County of London the appropriate department of the London County Council must be informed of the modifications to the benzole plant. As required by the Commissioners, one of the crude benzole storage tanks (5,700 gal.) was isolated from all other connections on the plant, and, because of the structural limitations, provided with a common suction and delivery. This feature called for careful manipulation when unloading tankers.

A second-hand steam pump was installed in a benzole plant yard and provided with an adjustable pressure relief valve and suitable valves and connections (see diagram). A glass covered visible flow indicator is included in the drainage system because the injection system beyond the pump is normally maintained under gas pressure. The distance (about 600 ft. of pipeline) from the pump to the point of injection on the outlet mains of the benzole scrubber towers precludes the use of the pump exhaust steam on the benzole heater. The partially refined benzole is delivered by road tanker and so far as possible a tanker takes a load of crude benzole on the return journey in order to minimize transport charges. The storage capacity is little more than one day's injection capacity so that the system proved somewhat inflexible due to time taken in unloading and loading.

Preliminary Tests

Two tests of a few hours duration were carried out to determine the correct working conditions. With an injection pressure of 100 lb. per sq. in. each spray proved capable of passing about 55 gal. per hour with a benzole temperature of 200°F.

A paper presented to the London and Southern Junior Gas Association, May 4, 1956

The heater had been designed to raise the benzole to steam temperature, for which purpose it worked efficiently. However, when the benzole temperature reached about 300°F. the injection rate fell off rapidly by about 60%. The sprays emitted a musical note. The boiling point of benzole at 117 lb. per sq. in. is 320°F. so that it is assumed that this effect was due to boiling taking place in the pipelines to the sprays. Assuming that, under these conditions, the sprays present roughly equal resistance to liquid and vapour then the rates of mass transfer liquid:vapour are 3½:1. For subsequent runs the benzole temperature was hand controlled at 180°F.-200°F., and a thermostatic valve was prepared to perform this duty. Calorimeter services were arranged so as to be able to determine the calorific value before and after enrichment.

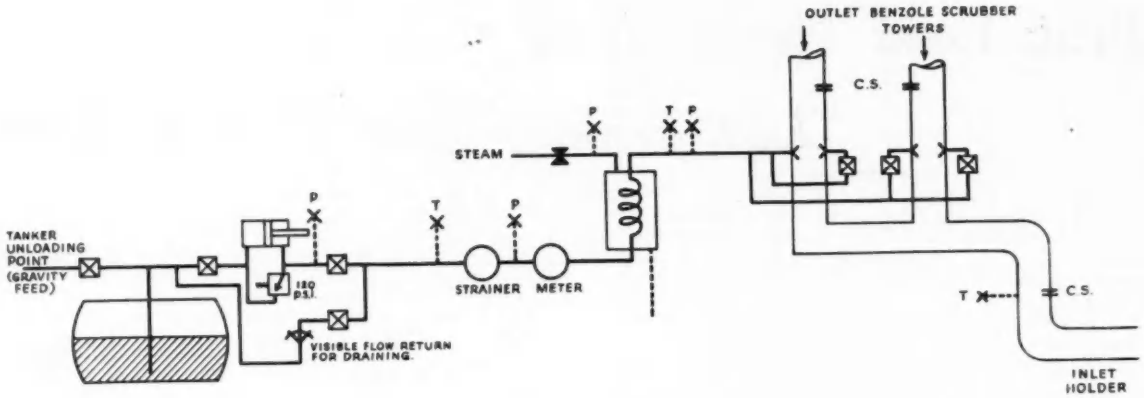
Peak Load

On January 31 the cold spell started and the injection system was run for 24 hours a day. During February the average district calorific value was 515.8 B.Th.U. per cu.ft., which represented a benzole enrichment of the order of 25-30 B.Th.U. per cu.ft. The system proved trouble free, requiring only occasional inspection by the benzole plant attendant, except for the night of February 1/2, when the atmospheric temperature dropped to 19°F. When the temperature had fallen only as far as 21°F. the temperature of the benzole arriving at the filter was 28°F. Small grains of ice formed in the benzole and congealed on the filter. Working with a reduced capacity in the heater, some heat for vaporization has to be taken from the gas.

Costs

From the quantities given, the cost per therm of the benzole injected can be calculated as 19.9d. and the cost of butane under similar conditions 13.2d. This assumes, however, that the district calorific value is increased for the limited period of the cold spell, which may not be recoverable.

The cost of butane, using butane/air mixture to give 10% increased volumetric output at the declared calorific value appears as 14.7d. per therm, assuming the same load factor and



P PRESSURE
T TEMPERATURE
C.S. CALORIMETER SERVICE

The Benzole Injection System at Fulham.

a ready supply of butane for refilling storage tanks (two refills). At one filling of the storage tanks per annum the cost rises to 21.2d. per therm.

Effect on Mixed Gas

Consideration of the effect on organic sulphur content of the gas shows that by using partially refined benzole the sulphur content of the gas was increased, but by less than half the increase that would have resulted from by-passing the benzole plant for the same degree of enrichment. The use of butane/air mixture would lower the organic sulphur content by dilution of the mixed gas.

A direct line from the inlet holder main to Watson House enabled the laboratories there to examine the effects of the enriched gas on appliances at a wide range of calorific values. From this examination it appears that enrichment up to 525 B.Th.U. per cu.ft. does not present serious difficulties except on certain sensitive appliances. Above that values sooting becomes marked and is difficult to burn off.

It seems possible to increase the thermal output of a manufacturing station during a short period at a cost of very little above that of the raw material for benzole and with a small capital charge for butane. Of particular advantage is that this can be done with the minimum of attendance and supervision at a time when such services are most in demand on other parts of the gas manufacturing plant, and without further loading the purification plant.

Resume of Appendices

The following is a resumé of the appendices to Mr. Grant's paper.

The steam pump of 300 gal. per hour capacity is installed in the benzole plant yard with its suction connected to an existing tank of 5,700 gal. capacity. Within the limitations made by the existing connections the pump suction and tanker delivery are common; unless considerable care is exercised when unloading a tanker this results in loss of suction.

On the benzole scrubber towers the benzole line from the injection pump is led past a thermometer, filter, pressure gauge and meter into the coil of a steam heater consisting of 50 ft. of ½ in. bore 16G. solid drawn copper tube enclosed in an 8-in. steel cylinder, lagged, and with benzole outlet connection lagged. A thermometer and pressure gauge are fitted before the connection to four sprays, three controlled by Audco plug cocks, the fourth left permanently open to protect the heater from excessive pressure.

The meter (Kent 'M' type) is used only as a rate indicator, the consumption of benzole being measured by dip.

The sprays used were supplied by H. T. Watson, Ltd., Widnes, and were type B25PM, ½-in. B.S.P. with B25/2 hollow cone nozzles, orifice 187. This spray is quoted as capable of passing 68 gal. per hour water at 100 lb. per sq. in. It is readily mounted in a gas main by under-pressure drilling and tapping of a ½-in. hole, the spray being delivered suitably threaded. The spray delivers into the gas stream with the axis of the cone at right angles to the axis of the main.

In the Fulham installation the two tower scrubbers have a vertical outlet each, into each of which two sprays are inserted at a convenient height for operation. This also allows sufficient length of main for adequate mixing before the calorific value sampling point and inlet to holder.

On January 17 this year during a test run, the following results were achieved:

Time	Benzole injected (dips) gal.	Average Flow rate meter gal. per hour	Enrichment B.Th.U. per cu. ft.
10.30-11.00 ..	—	200	− 2
11.00-12.00 ..	217	190	+15
12.00- 1.00 ..	146	190	+21
1.00- 2.00 ..	144	160	+17
2.00- 3.00 ..	134	160	+20

Between 1 p.m. and 2 p.m. the injection rate fell off sharply when the benzole temperature was allowed to rise to 300°F. The negative enrichment is believed to be due to preferential distribution of a low calorific value gas into one of the towers when the gas sample was taken from the other tower outlet main.

Summary of results:

Date	Benzole injected gal.	Cu. ft.	Therms
January 17	586	26,370	938
January 31 – February 6	24,894	1,120,230	39,831
February 9 – February 25 ..	65,489	2,947,005	104,782
Total	90,969	4,093,605	145,551

GERMAN COAL WASHING

AN interesting new development in coal washing techniques from Germany is reported by the *Financial Times*. It appears that the firm of Badische Anilin und Soda Fabrik has been experimenting with chemical sedimentation aids to precipitate matter suspended in the water during the cleaning process.

The B.A.S.F. method aims to avoid this difficulty. By adding one-third of an ounce of special chemicals per 100 cubic yards per hour it has been able to clear the water and enable it to circulate freely, so reducing wear and tear on pumping machinery and need for draining space. The efficiency of filter and flotation plants, it is claimed, is considerably improved, and separation simplified by elimination of centrifuges. Less usable coal finds its way into refuse, and screening of damp coal is improved to a point where there is a substantial reduction in the water content of fine coals. Experiments have been successfully carried out in Germany, France and the Netherlands.

16

OIL GASIFICATION PLANTS

(HALL PROCESS OF AMERICAN GAS ASSOCIATION)

now in operation* or under construction†

TWO SHELL SETS

		Number of Sets	Millions cu. ft./day
†	ALFORTVILLE, FRANCE	1	6·5
*	BROCKTON, MASS.	1	5
*	CAMBRIDGE, MASS.	2	13
†	**GLOUCESTER, ENGLAND**	**1**	**1·5**
*	LOWELL, MASS.	1	5
*	LYNN, MASS.	1	6
*	LYNN, MASS.	2	9
*	NEW BEDFORD, MASS.	1	5

FOUR SHELL SETS

*	BALTIMORE, MARYLAND	1	5·5
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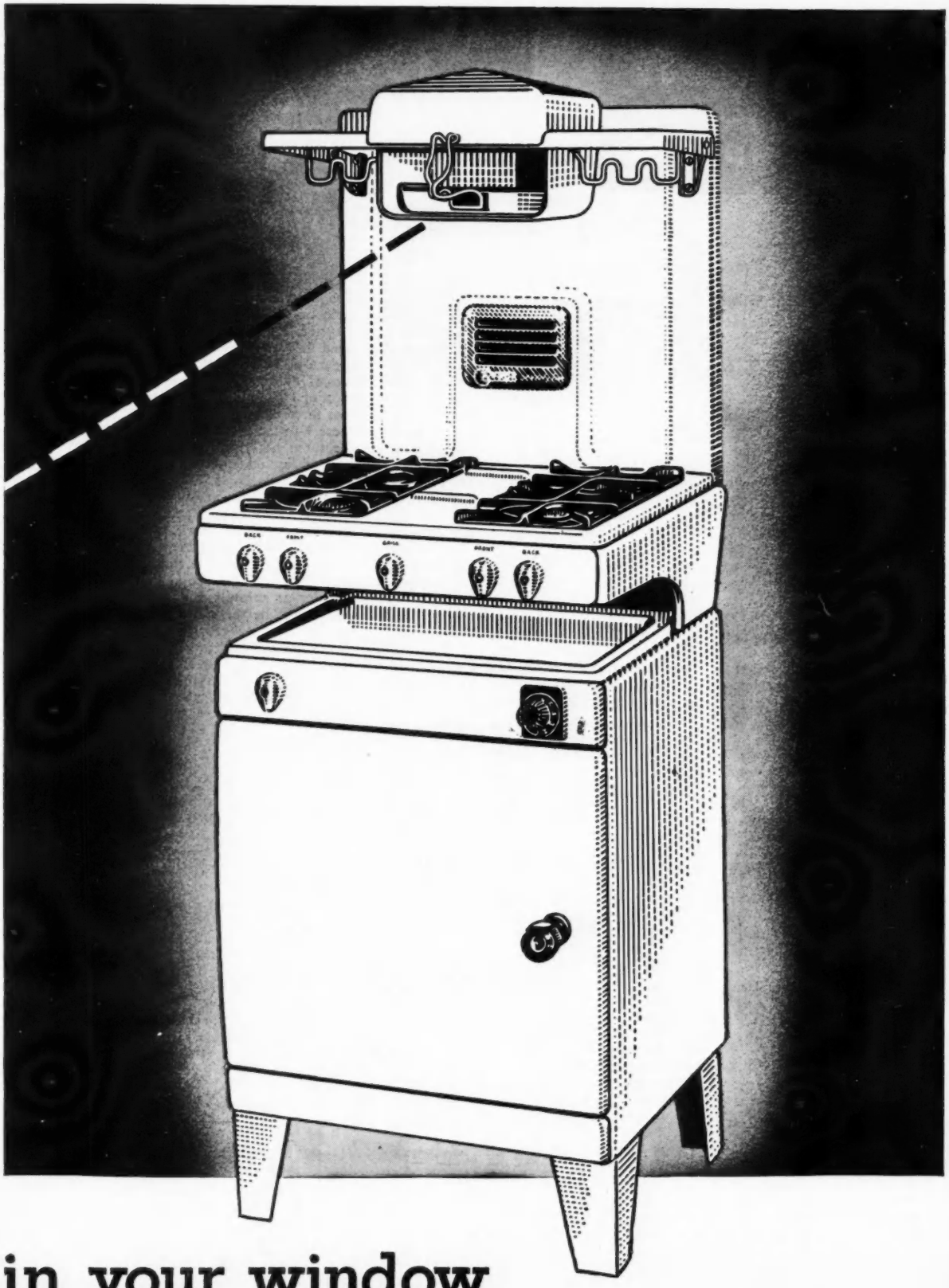

in your window

Liquid Gas . . . an investigation

By JOHN D. CRECCA, Jnr.

(Continued)

Changes in Weight Due to Conversion

The alterations to convert the T2 tanker for carrying methane will result in increasing the vessel's light ship weight and deadweight. Summarizing the change in weights, deadweight and loaded displacement are as follows, all figures in long tons:

		Tons
Present light ship ships plans		5,252.0
Estimated additional weights for proposed alteration including 5% margin		770.6
New light ship weight		6,022.6
Service deadweight fuel, feed water, drinking water, ship's stores, dry cargo		2,110.2
Cargo deadweight:		
Liquid methane 92% full	1,710.10	
Cargo oil 98% full	9,620.56	
New cargo deadweight	11,330.66	11,330.66
New total deadweight		13,440.86
New light ship weight		6,022.60
New loaded displacement		19,463.5

Methane Liquefaction Cycles

In this section various types of liquefaction cycles will be considered. A detailed design will not be attempted because much of the equipment that will be necessary is not new. The compressors, heat exchangers, throttles, *etc.*, are standard equipment as compared with the new requirements of the tanker. It will be the purpose of this section of the design to establish a cycle on the 'flow diagram' stage so that cost estimates of the system may be made.

It was established in Part III that low temperature processes are not new. In general they fall into three groups:

(1) Vaporization of a liquid; (2) Joule-Thompson effect on gases; (3) expansion of a gas in an engine doing external work. By setting up these three classes, it is not meant that a process must be one of these. In fact, many are a combination. However, they are the three basic types to work with.[3, 16, 17].

The vaporization of liquids is the basis of the cascade system. In theory, the cascade has an advantage over the other systems because there is the least amount of irreversible work. It can be seen in Fig. 3 that there is an isenthalpic expansion of each gas at points 5, 23 and 33. However, in each case, the expansion takes place when the substance is in the liquid range. Thus, the change in entropy is small as compared with a gaseous expansion. If the substance to be liquefied is introduced to the expander at a low temperature, the irreversible work may be reduced. In the cascade system a series of vaporizing liquids are used to reach the low temperature needed to liquefy the desired substance. Rubemann has given the theoretical work required to liquefy a gallon of methane by several cycles[3]. He has shown that of all the common industrial methods, the ammonia-ethylene-methane cascade

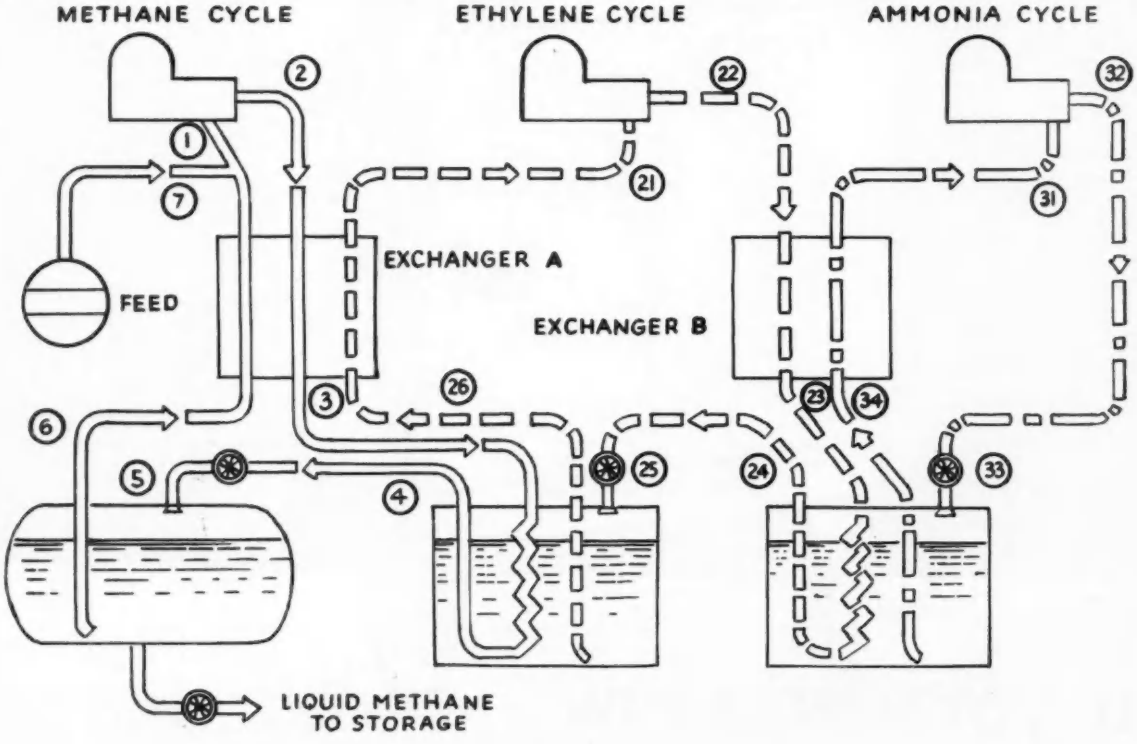

Fig. 3.

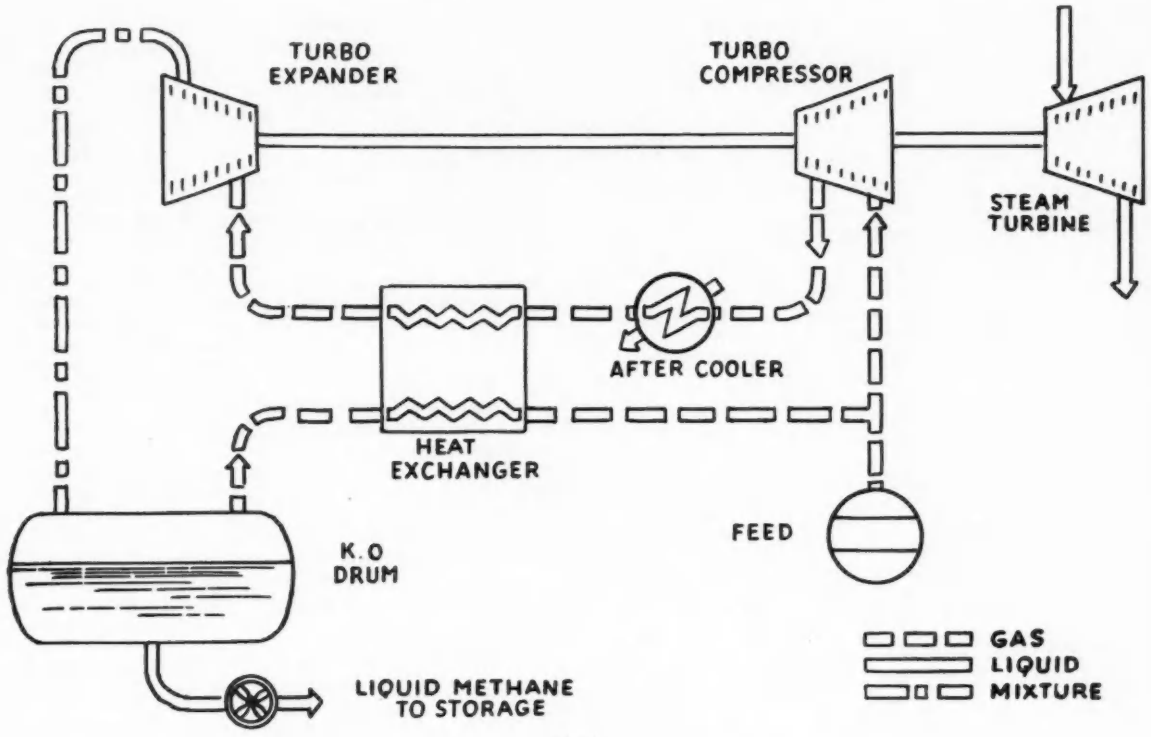

Fig. 4.

system requires the least work. However, the theoretical advantage has been reduced considerably in actual practice due to the complexity of the system.[16]

The Joule-Thompson expansion is the basis of the Linde process. The simplified flow diagram is similar to a single unit of the cascade system. However, instead of having one evaporating liquid condense another, the vapour from the isenthalpic expansion is used to cool the incoming gases. The expansion is initiated in the gaseous region, thus producing less liquid at its terminal point in the heterogeneous region and involving a greater change in entropy than the cascade system.

Although the Joule-Thompson expansion is theoretically inferior to the other processes, it has been improved a great deal by increasing the pressure and lowering the temperature with an auxiliary ammonia cooling cycle. For an ideal gas the Joule-Thompson coefficient is zero. For a given set of conditions the value increases the more imperfect the gas or liquid. As a result, methane is more easy to liquify than air by this process.

The pressure and temperatures involved have an effect on the Joule-Thompson coefficient. In order to be effective for liquifaction, the coefficient must be positive. A change from a positive to a negative value will take place at what is known as the inversion temperature. The coefficients of hydrogen and helium, which are negative at room temperature become positive at low temperatures and high pressures[2, 16, 17]. However, Rubemann has shown that just the opposite is possible. As pressure increases and temperature decreases, the coefficient may become negative.[3]

Claude modified the Linde process by tapping off about 20% of the main stream high pressure gas and running it through an expansion engine. The gas thus cooled would be used as a coolent for the main stream. Heylandt further modified this process by increasing the amount of air going to the expander to 45%. The great selling points for these processes are the nearly isentropic expansion and possible recovery of some of the work put into the systems by use of the expander[3, 16].

The greatest difficulty encountered in the early days of these processes was developing a suitable expander. The first type to be used was a reciprocating piston with a low order of efficiency. However, in recent years turboexpanders with efficiencies in the order of 80% have been developed[3, 16].

The general overall thermodynamic efficiency of the best low-temperature processes is very low. This is a result of friction heat, leaks, throttling, etc. However, the largest contribution is made in the rectifying columns during the mass transfer of fluids not in equilibrium[16]. Since there is no gas separation in this process, the efficiency of the proposed process will be considerably higher than the conventional gas separation process.

Liquefaction Cycles

The cost of the power plant is the largest single cost in the liquefaction cycle. Thus, the power requirements are a prime consideration in the selection of a cycle. Although, as it was pointed out previously, the complexity of the cascade system reduces its theoretical power advantage, it forms a good basis on which to compare the standard commercial systems with the new ones to be investigated.

The flow diagram of a cascade system may be seen in Fig. 3. It is similar to Fig. 6. Both use the same type of gases as coolants. The values used in the design are based upon Keesom nitrogen cascade given in Rubemann except the nitrogen cycle has been left out[3]. The only difference between this system and the one Rubemann proposes for the methane liquefaction lies in the pressure ranges of the ethylene cycle. In the cycle in Fig. 3 the pressure ranges from 1 to 19 atmospheres while in the proposed system for methane as the end product, the range runs from 1 to 13 atmospheres[3]. However, the end result does not differ greatly.

The feed gas is introduced at about four atmospheres (59 lb. per sq. in.) while the gas from the exchanger is at one atmosphere. The combining of the two streams gives a suction pressure of five atmospheres to the compressor. It is discharged from the compressor at 24.7 atmospheres, cooled in a countercurrent heat exchanger and liquefied at this pressure by the vaporizing ethylene. The liquid methane is then expanded isenthalipicly to one atmosphere. The liquid is drawn off from the K.O. drum while the vapour returns to the compressor. The ethylene and ammonia cycles are similar.

[16] Perry, J. H. 'Chemical Engineers' Handbook,' 3rd Ed., McGraw-Hill, New York, 1950.
[17] Smith, J. M. 'Introduction to Chemical Engineering Thermodynamics,' McGraw-Hill, New York, 1949.

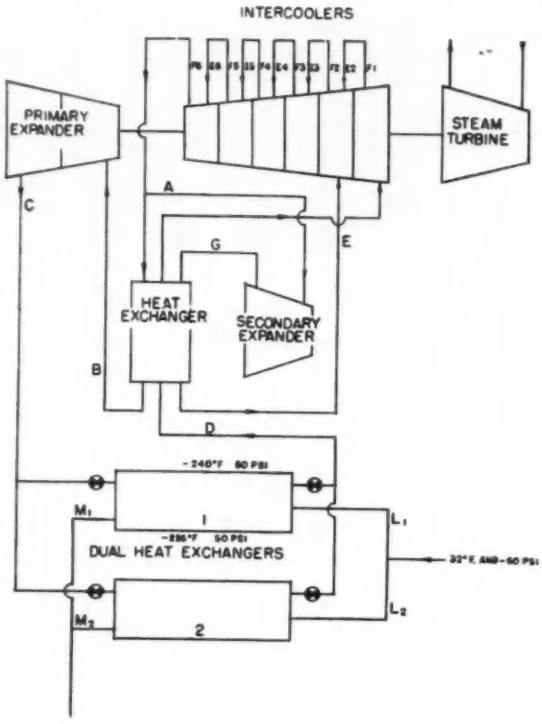

Fig. 5.

The additional work required by the Linde and Heylandt cycles is given in Table IV. It can be seen from these calculations that the additional theoretical work may be quite high. In actual practice they will be even higher.

TABLE IV

Work to Liqufy 43 mill. Cu.Ft. per Day

Cycle	Horsepower
Ammonia-ethylene-methane cascade	47,700[1]
Ethane-methane cascade	65,400[1]
Linde cycle with high pressure and NH_3 refrigeration	62,300[1]
Linde cycle with NH_3 refrigeration	68,600[1]
Lende high pressure cycle	86,000[1]
Hdylandt cycle	88,000[1]
Simple Linde cycle	143,000[1]
Two cycle expansion	71,620[2]
Nitrogen cycle	114,650[2]
Proposed cycle	43,770[3]

1. Theoretical based upon the values given in Rubemann.
2. Theoretical based upon the author's calculations.
3. Actual based upon the author's calculations.

The two-cycle expansion process is one of the two methods that is described by Sage and Lacey.[18] Fig. 4 is a simplified flow diagram of the process. The gas enters the cycle at 30 lb. per sq. in. absolute, and is compressed in four stages and cooled. It is then run through a heat exchanger where the temperature is assumed to drop to the saturation point. If the methane does not enter the expander at this point, the amount of liquid formed is negligible. The gas is then expanded according to the path $Tds = -0.35dH$. The liquid yield per pound mole of methane processed is 0.081 pound moles. There is an additional drawback besides the small yield. The expansion in the heterogeneous region is poor. It not only requires a special type of expander but the mechanical efficiency is poor.

The nitrogen cycle (see Fig. 5) was developed with the idea of eliminating the unfavourable heterogeneous expansion.[18] The nitrogen is compressed, then expanded to a temperature of −270°F. Thus, the expansion is above the heterogeneous region. The nitrogen from this expander is then used to liquefy the methane. The methane enters and leaves the exchanger at about the same pressure.

The drawback to this system is the use of sensible heat to cool the methane. The enthalpy change to liquefy at 50 lb. per sq. in. absolute is quite large.

The proposed system may be called a high pressure methane-

[18] Sage, B. H., A. N. Lacey, 'Liquefaction of Methane,' a report prepared for the Joshua Hendy Corporation, July 1954

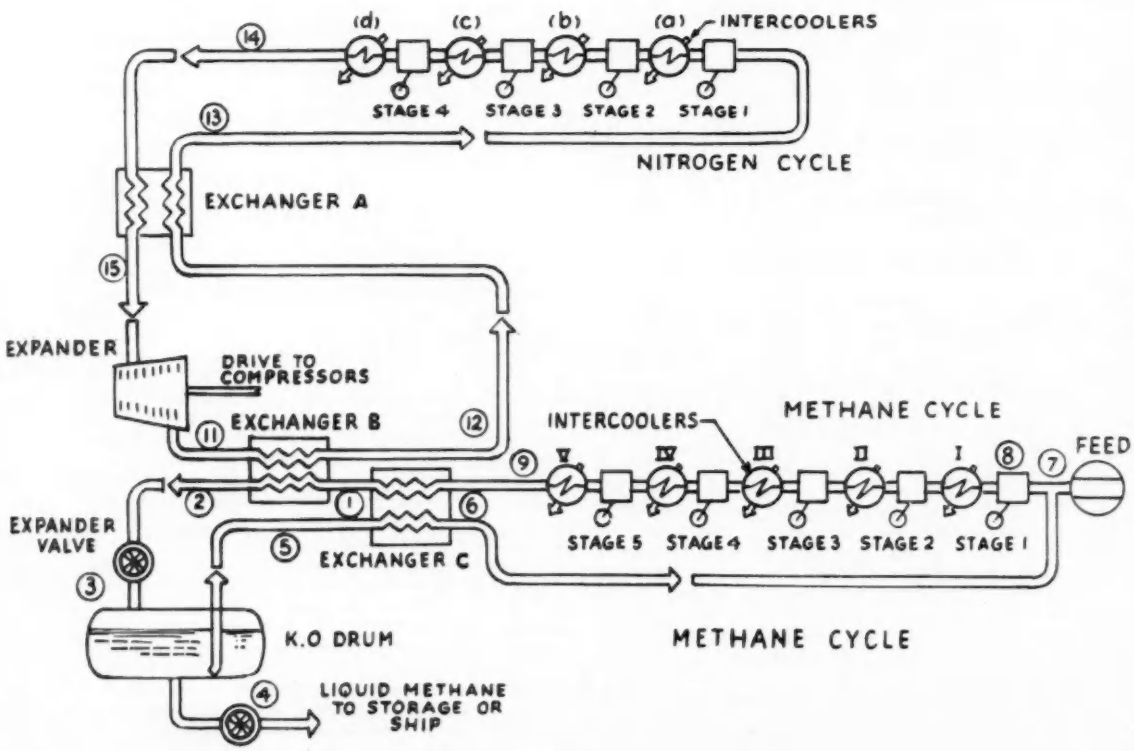

Fig. 6.

nitrogen cycle (see Fig. 6). The advantages of the design are: (1) The elimination of any heterogeneous expansion; (2) the gaining of useful work while expanding the nitrogen; (3) advantage is taken of the fact that a given increase in the compression ratio of gas does not require nearly as much power to accomplish the compression as a similar increase in the volume of flow.

The mechanical disadvantage of a heterogeneous expansion has been pointed out previously. Thus, by using a coolent gas, such a nitrogen which has a lower dew point than methane, in the manner suggested by Sage and Lacey (see Fig. 5), the advantage of expansion cooling in a homogeneous state is obtained. In this manner, the mechanical design is simplified and the expansion work obtained is greater than a heterogeneous expansion.

To find the work of compression the equation

$$-w = \frac{SRT_1k}{k-1}\left[\left(\frac{P_2}{P_1}\right)^{\frac{k-1}{Sk}} - 1\right]$$

is used. In the equation w is in B.Th.U.'s per pound mole, S is the number of stages, R is the gas constant, k is the ratio of the heat capacities, P_1 and P_2 are the initial and final pressures, and T_1 the initial temperature. By examining the above equation, one may see that an increase in the pressure ratio would not increase the work of compression nearly as much as increasing the flow rate.

The change in enthalpy when liquefying methane at 600 lb. per sq. in. is less than the change at 50 lb. per sq. in. By taking advantage of this smaller change in enthalpy at higher pressures and the smaller increase in work per pound of methane processed caused by a pressure increase as opposed to a greater flow rate of coolent at low methane pressure, a reduction in total work is obtained that more than offsets the fact that more methane must be processed at a high pressure to produce a pound of liquid than at low pressure.

The design of the shore tank does not differ much from that on the tanker. The materials of construction must be the same, a vent system must be provided in both cases, and the insulation thickness is the same.

There is one feature that is unique in the shore tanks—the circulation pump. In the Bureau of Mines report, the possibility of the natural gas superheating is mentioned.[10] They consider that the tank may have received a sudden shock due to a quick boiling. This phenomena is a result of the different densities of the components of natural gas. When the gas is liquefied, each component forms a separate layer depending upon the density. As a result, a film resistance to heat flow is set up in each strata and the heat cannot be disseminated throughout the tank. Thus, it may be possible for one of the components to absorb enough heat to flash off. This condition is very likely to occur if any nitrogen has been liquefied with the natural gas. Nitrogen is heavier than methane but boils at a lower temperature. It is not considered necessary to have the circulation pump on the ship because of its rolling.

It is recommended that a dam be placed around the tank to form a volume large enough to hold a full tank. No drainage system is advocated. In the Cleveland accident, much damage was caused when the gas entered the drainage system and exploded. If the ground around the tank is porous, it will absorb some of the liquid in case of spillage. However, due to the low boiling point of the gas, it will all eventually evaporate.

The piping should be made of type 304 stainless steel. It is recommended that the insulation be placed on the outside of the piping to reduce the friction.

The gas heat exchangers should be made of type 304 stainless steel clad shell with type 304 stainless steel tubes. Ordinary tubes and shells may be used in intercoolers.

It may be seen from Table IV that the high pressure methane-nitrogen process requires less power than the others. The efficiencies used for the machinery were the minimum or average of those given in current literature. Since all of the processes will involve similar equipment, the final choice was made on the basis of power requirement.

(*To be continued*)

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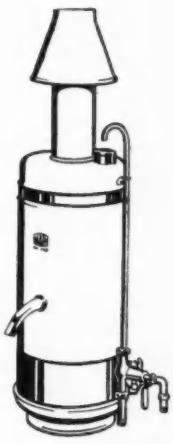

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TRADE NEWS

RUST-PROOFING STEEL CHIMNEYS

A liquid metallic coating for rust-proofing steel chimneys has been developed by Southern Metalife, Ltd.

The painting of steel chimneys has always been a problem, usually necessitating yearly re-painting. Most paints soften at temperatures above 200°F.

Special heat resisting aluminium paints can give good protection at temperatures *above* 700°F., but depend on the high temperature to stove, cure or alloy the aluminium coating to the steel. As most steel chimneys operate at temperatures below 600°F., these aluminium paints are not effective on the average chimney.

Metalife ATR liquid metal withstands all temperatures up to 600°F. It is applied cold by a paint brush or spray gun and dries to leave an anodic metal skin on the steel surface which gives cathodic protection to the chimney.

This product has been tested during the past three years on steel chimneys throughout the country and it has been found to increase their life considerably. The much longer protection it gives makes possible a substantial reduction in maintenance costs and cuts out the necessity for annual repainting.—*Southern Metalife, Ltd., Princes Street, Harrogate.*

Humidity Measurement

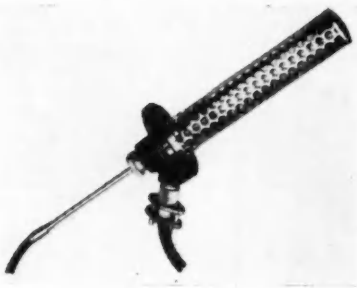
The Foxboro system of Dewpoint measurement can now be supplied with a specially adapted Dewcel for use in processes where flame hazards exist. The Dewcel element has been slightly modified, as shown in the accompanying photograph, and is provided with flame-proof connections, cable and transformer. As a result the factory department of the Ministry of Labour and National Service has granted a Certificate of Intrinsic Safety.

The already wide field of application for the Dewcel has thus been enlarged and the modified Dewcel may now be used, for example, in gas works, oil refineries or in the presence of hydrocarbon gas. It may also be used where humidity conditions are critical but where inflammable acetone or solvents are evaporated as in cellulose plants or where dryers and similar units are used on coated papers, carbon papers, adhesive tape, etc.

The Foxboro system of dewpoint measurement uses the Dewcel in conjunction with Foxboro recorders and controllers to provide a continuous, accurate record, read directly in dewpoint over a wide range of working temperatures. The Dewcel is simple and robust and will function perfectly in dirty atmospheres and has the advantage of requiring the minimum of maintenance. In fact, under normal conditions the only maintenance needed is the cleaning and renewal of the lithium chloride at six monthly intervals.

The unique Dewcel consists essentially of a thermometer bulb inside a thin walled metal tube covered with a woven glass tape impregnated with lithium chloride. The tube is wound with a pair of silver or gold wires over the tape and covered with a perforated metal guard. When the lithium chloride salt absorbs moisture from the surrounding atmosphere it becomes an electrical conductor so that current passes between the two wires thus raising the temperature of the Dewcel until equilibrium is reached.

This equilibrium temperature is measured with a conventional temperature bulb, either liquid expansion or electrical resistance thermometer type and is then



converted by the instrument to record in dewpoint temperatures, grains of moisture per lb. of dry air, grains of moisture per cu.ft., or percentage of water by volume.

The complete system comprises the Dewcel, a power unit and, either a liquid expansion type recorder or a Foxboro Dynalog recorder. In each case the system may be furnished with control mechanism for the automatic control of valves, dampers and motors, etc.—*Foxboro-Yoxall, Ltd., Lombard Road, Merton, S.W.19.*

Watertight Fitting

The R.E.A.L. 'Reflectortight' is an entirely new non-corrodible watertight lighting fitting which embodies a number of distinctive points of design, rendering it suitable for use under the most extreme working conditions.

All the advantages of a screw neck watertight fitting are retained. No outside fixing screws or locking devices are needed. Re-lamping is merely a matter of unscrewing the complete reflector member.

The heavy pressed glass cover is virtually unbreakable, rendering the Fittings specially suitable for many food manufacturing purposes. In heavily dust laden

atmospheres, cleaning can be carried out by hosing.

Specification is as follows:—Non-corrodible silicon-alloy cast top member engaging on all porcelain body (tough vitreous china) with internal threading; easy wiring porcelain lampholder assembly; gastight and dust-tight joint between top member and porcelain body; silicon alloy supporting ring reinforcing 3-point fixing of porcelain body to top member; bonded cork gasket providing positive joint between porcelain body; and screw neck reflector of heavy gauge aluminium specially treated; heavy section pressed heat resisting glass dome, permanently sealed in position at mouth of reflector.—*Rowlands Electrical Accessories Ltd., Birmingham, 18.*

Sealing Leaks

Furmanite is a semi plastic solid (made up in cartridge form for handy loading into an injector gun) which melts under initial heating, thus enabling it to be forced into the smallest apertures. On further heating the compound sets and forms a hard, elastic and permanent joint. It is thus ideal for sealing a faulty joint in a steam pipeline.

Another important characteristic of the compound is that, if it is necessary to take down a joint a Furmanite joint comes away intact.

The Furmanite kit—in three main sections—consists of the patented 'injector gun' which is of the screw-down type, and various sizes of adaptor lugs and unions, specially designed to ensure that injections can be made into the most awkwardly situated leaks; the baffle (to hold the compound in the leak until it sets) which is comprised of wire rope, Spanish windlass, jack block, lead strips and shims; and the general equipment, which includes heat resisting gloves, spanners for injector gun and windlass, copper washers, cleaning tool, boilermaker's clamp, and 60 sticks of compound.—*Furmanite Sales Co. Ltd., 638, Grand Buildings, Trafalgar Square, London, W.C.2.*

Insulation Material

A new slab material, Insulex, combining the best features of both moler—i.e., diatomite—and fibrous types of heat insulator, has recently been introduced by Moler Products, Ltd., of Colchester.

A particular application in the insula-

tion of large wall surface areas, Insulex possesses ample mechanical strength, and is quick and easy to install. Its temperature limit is 1,700°F.

Exceptional insulating efficiency results from the combination of diatomaceous earth, asbestos fibre, and exfoliated vermiculite used in the manufacture of the new material, for which new plant has been set up at Hythe Works, Colchester, already the largest and most modern works in the U.K. exclusively devoted to the manufacture of heat insulation materials.

A gradual change in heat insulation requirements has been apparent in recent years: the demand has increased for higher standards of thermal efficiency in industrial furnace practice, and in particular for materials of very low conductivity in the medium temperature range.

In furnace design, too, the steady transformation to plated wall constructions has rendered the conventional all-brick structure obsolescent.

Steel furnaces, high pressure boilers and gas retorts are all being increased in size, and the call is for insulation material easily installed with a minimum of joints over large, flat, wall surfaces with sufficient mechanical strength to resist settlement.

In these, and indeed all, 'back-up' applications, Insulex will provide the most acceptable and efficient insulation—used either alone or in combination with insulating and insulating refractory bricks, such as the 'Fosalsil' and M.P. grades manufactured by Moler Products, according to structural requirements and temperatures.

As Insulex is most frequently used in plated wall constructions, a special liquid adhesive is supplied to fix it to the metal casing pending the erection of the brick lining. The adhesive is also suitable for securing the slabs to brick surfaces.

Insulex slabs are normally laid dry, the sharply defined edges ensuring minimum heat loss at joints. A special mortar is available, however, to provide continuity of insulation if preferred.

Insulex is available in five standard slab sizes and five thicknesses packed in cartons or export cases. Non-standard sizes will be made to special order.—*Moler Products, Ltd., Hythe Works, Colchester, Essex.*

Whitlock Dump Trailer.

Tipping Dump Trailer

A new all steel hydraulic tipping dump trailer with a capacity of three tons has been introduced by Whitlock Bros., Ltd., Great Yeldham, Essex. The Whitlock dump trailer offers distinct advantages to the builder and contractor, for not only is the tractor trailer combination cheaper than trucks and lorries, but also because of greater safety and convenience in operation, for a trailer and tractor can often be used on sites inaccessible to trucks and lorries.

The axle of the trailer is so placed that part of the weight of the trailer is transferred to the rear axle of the tractor ensuring traction on soft ground.

Dumping is effected by a two stage ram which is operated from the tractor. The tipping of the trailer is under positive control at all times and can be stopped at any angle. The high angle of tip ensures dumping the load without spreading while its low centre of gravity makes it possible to use the Whitlock dump trailer for continuous spreading.

The sloping sides of the trailer body ensure that sticky materials can be dumped without difficulty. The tipping ram operates at 2,000 lb. per sq. in. pressure which is suitable for most makes of tractor. The body of the trailer is of ¼ in. reinforced welded steel sheet and the chassis constructed from 5 in. x 2½ in. channel.—*Whitlock Bros., Ltd., Great Yeldham, Essex, England.*

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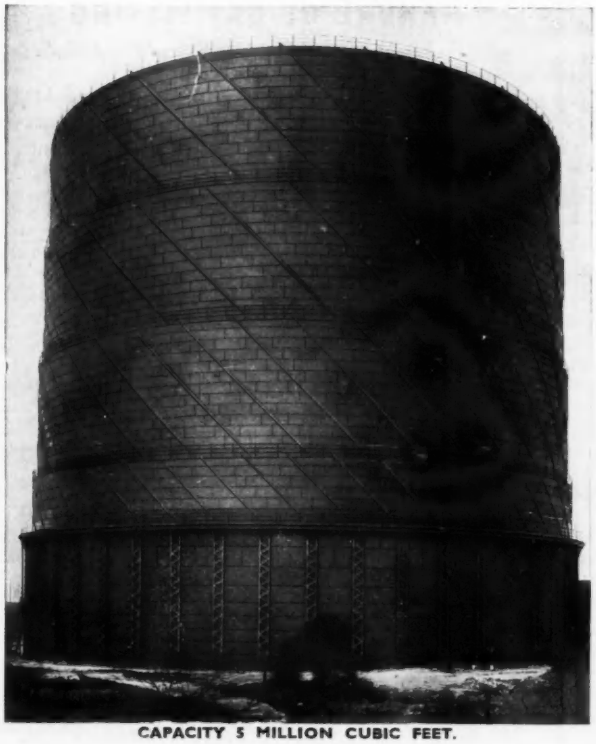

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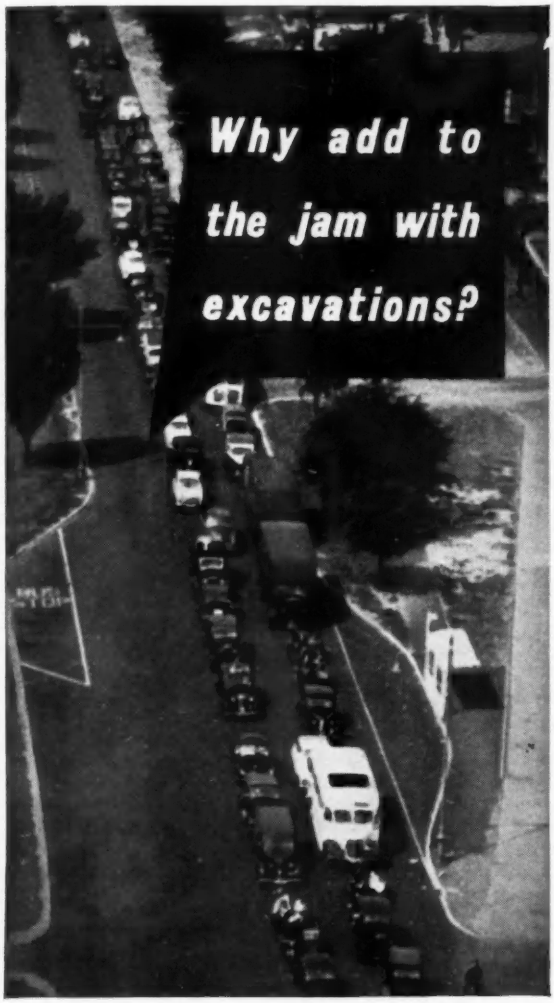

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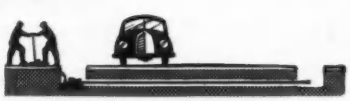

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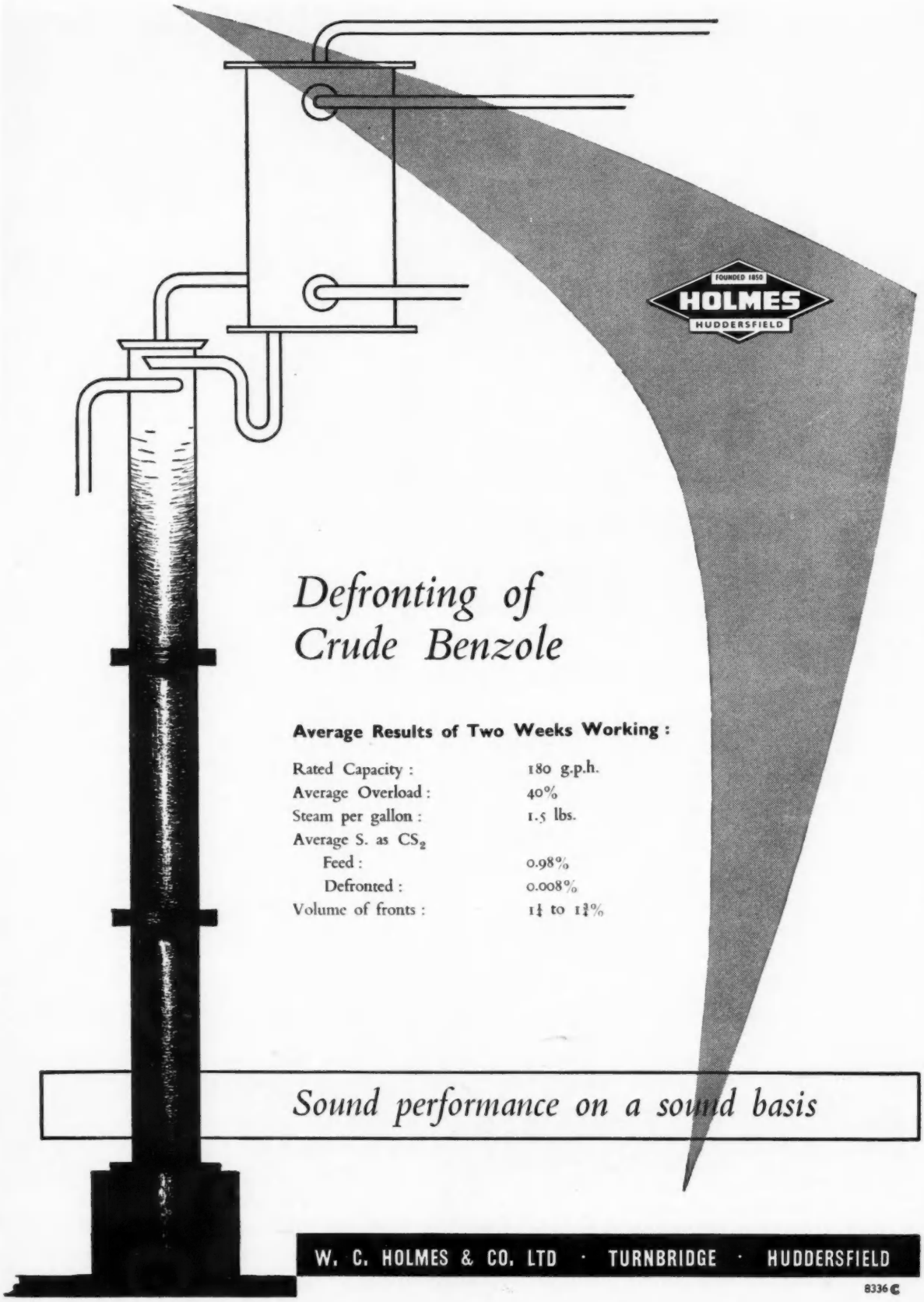

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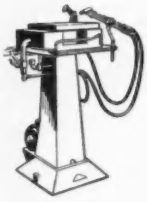

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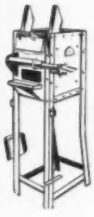

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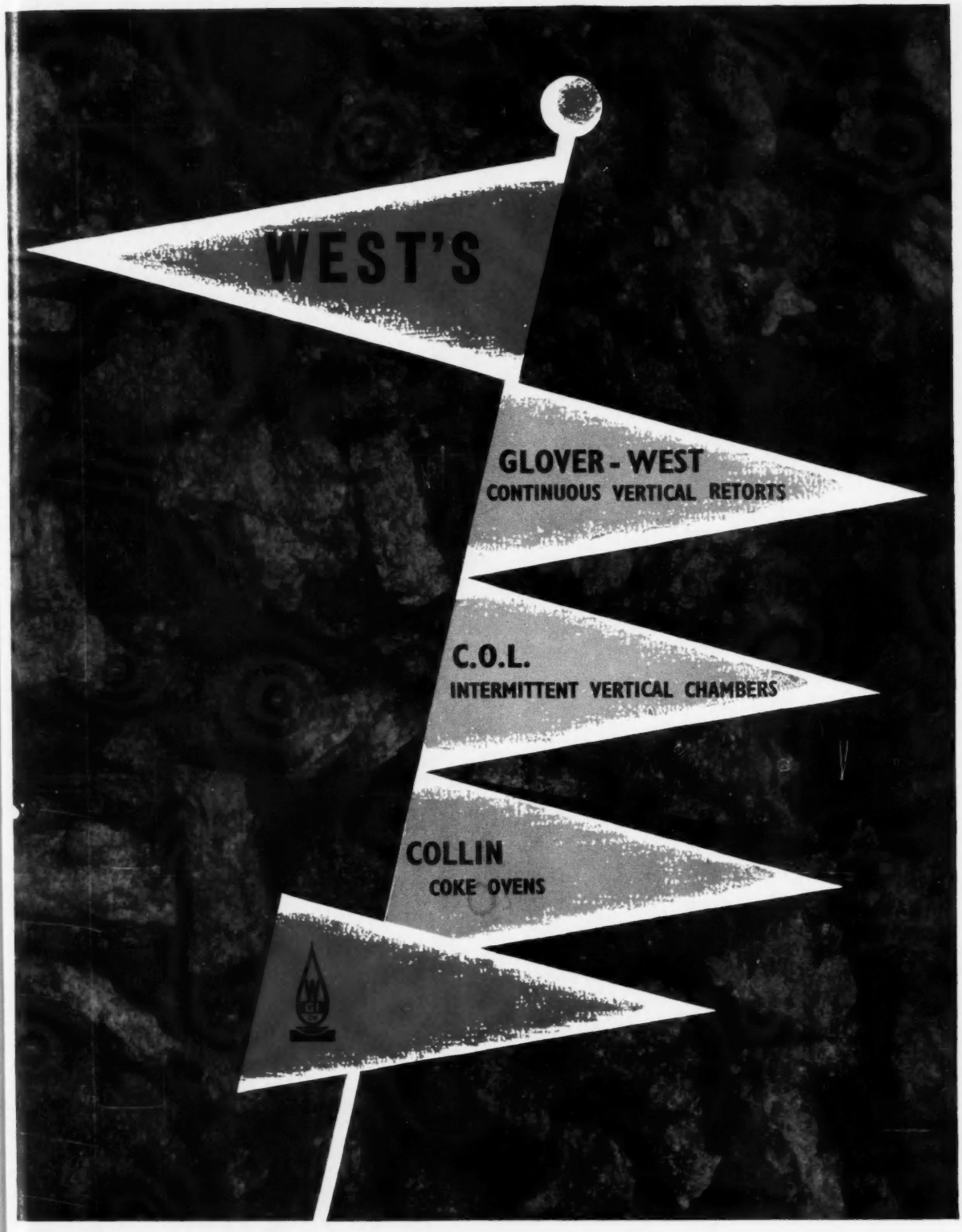

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